SPSC

Sukkur IBA STS

SIBA Testing Service

IBA | SPSC | NTS

HST | SST

HIGH SCHOOL TEACHER | SECONDARY SCHOOL TEACHER

TEST GUIDE

ETEA

SCHOOL LEADER GUIDE

(BPS-16)

SPSC

Sukkur IBA STS

SIBA Testing Service

PART ONE NOTES

MAJOR SUBJECTS FOR HST/SST

Chemistry

Physics

Biology

Mathematics

CONTENTS

BIOLOGY

THE CELL

1. **Smallest unit controlling all activities of life is**
(a) Cell (b) Tissue (c) Organs system (d) None of them
2. **Cell was discovered by**
(a) Robert Brown (b) Lorenz Oken (c) Robert Hooke (d) Schwann
3. **Nucleus was discovered by**
(a) Robert Brown (b) Lorenz Oken (c) Robert Hooke (d) Schwann
4. **Cell theory was put forth by**
(a) Robert Brown (b) Lorenz Oken (c) Robert Hooke (d) Schwann
5. **Basic part of cell is considered as**
(a) Nucleus (b) Cytoplasm (c) Cell membrane (d) All of them
6. **According to abiogenesis theory, living things are formed from**
(a) Living things (b) Non-living things (c) Both a and b (d) None of them
7. **Virchow's hypothesis was supported by**
(a) Robert Brown (b) Lorenz Oken (c) Robert Hooke (d) Louis Pasteur
8. **According to cell theory, new cells are formed from**
(a) Automatically (b) Pre-existing cells (c) Tissues (d) All of them
9. **Conduction of salt and water is provided by**
(a) Xylem cells (b) Phloem cells
(c) Sclerenchyma cells (d) Cholenchyma cells
10. **In plants, translocation of food is provided by**
(a) Xylem cells (b) Phloem cells
(c) Sclerenchyma cells (d) Cholenchyma cells
11. **In plants, support is provided by**
(a) Xylem cells (b) Phloem cells
(c) Sclerenchyma cells (d) Cholenchyma cells
12. **In plants, photosysthesis is performed in**
(a) Xylem cells (b) Phloem cells
(c) Sclerenchyma cells (d) Cholenchyma cells
13. **Surplus food of plant is stored in**
(a) Sclerenchyma cells (b) Cholenchyma cells
(c) Parenchyma cells (d) Meristematic cells
14. **Growth of plant is provided by**
(a) Sclerenchyma cells (b) Cholenchyma cells
(c) Parenchyma cells (d) Meristematic cells
15. **Chromatin material of eukaryotic cells is present in**
(a) Nucleus (b) Cytoplasm (c) Both a and b (d) Absent
16. **Chromatin material of prokaryotic cells is present in**
(a) Nucleus (b) Cytoplasm (c) Both a and b (d) Absent

17. **Fractional component of cell membrane is**
(a) Proteins (b) Lipids (c) Carbohydrates (d) All of them
18. **Percentage of protein in plasma membrane is**
(a) 20 – 40 % (b) 40 – 60 % (c) 60 – 80 % (d) 80 – 95 %
19. **Percentage of lipids in plasma membrane is**
(a) 20 – 40 % (b) 40 – 60 % (c) 60 – 80 % (d) 80 – 95 %
20. **The pores of cell membrane through which materials pass are**
(a) Charged (b) Neutral (c) Both a and b (d) None of them
21. **Materials pass through cell membrane by**
(a) Active transport (b) Passive transport (c) Both a and b (d) None of them
22. **The material passing through cell membrane must be**
(a) Small in size (b) Neutrally charged (c) Both a and b (d) Large in size
23. **Uphill movement of ions across cell membrane is termed as**
(a) Active transport (b) Passive transport (c) Diffusion (d) Osmosis
24. **ATP is essential for**
(a) Active transport (b) Passive transport (c) Both a and b (d) None of them
25. **Downhill movement of ions across cell membrane is termed as**
(a) Active transport (b) Passive transport (c) Pinocytosis (d) Phagocytosis
26. **Intake of material by infolding of cell membrane is termed as**
(a) Phagocytosis (b) Pinocytosis (c) Endocytosis (d) All of them
27. **Intake of solid particle by cell is termed as**
(a) Phagocytosis (b) Pinocytosis (c) Endocytosis (d) All of them
28. **Intake of liquid material by cell termed as**
(a) Phagocytosis (b) Pinocytosis (c) Endocytosis (d) All of them
29. **Cell membrane transmit nerve impulses in**
(a) Selected muscle (b) Neuron (c) Nephron (d) None of them
30. **Cell wall of animal cell is**
(a) Well developed (b) Poorly developed (c) Rudimentary (d) Absent
31. **Cell wall is secreted by**
(a) Cell membrane (b) Nucleus (c) Cytoplasm (d) Protoplasm
32. **Cell wall consists of**
(a) Two layers (b) Three layers (c) Four layers (d) One layer
33. **Primary wall is composed of**
(a) Cellulose (b) Hemicellulose (c) Pectin (d) All of them
34. **Secondary wall is composed of**
(a) Silica (b) Waxes (c) Cutin (d) All of them
35. **Cellulose of prokaryotic cell wall is**
(a) Large in amount (b) Less in amount (c) Absent (d) None of them
36. **Thickest layer of cell wall is**
(a) Primary layer (b) Secondary layer
(c) Middle lamella (d) All are equally thick

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37. **Murein is present in cell wall of**
(a) Eukaryotic cells (b) Prokaryotic cells (c) Fungal cells (d) None of them

38. **Chitin is present in the cell wall of**
(a) Eukaryotic cells (b) Prokaryotic cells (c) Fungal cells (d) All of them

39. **Cellulose is present in cell wall of**
(a) Eukaryotic cells (b) Prokaryotic cells (c) Fungal cells (d) None of them

40. **Material passing through cell wall must be**
(a) Large in size (b) Small in size (c) Neutral in charge (d) All of them

41. **Soluble part of cytoplasm is termed as**
(a) Sol (b) Gel (c) Cytosol (d) Colloidal Solution

42. **Ground substance of cytoplasm consists of**
(a) Sol (b) Gel (c) Cytosol (d) Colloidal Solution

43. **Major component of cytoplasm consists of**
(a) Proteins (b) Carbohydrates (c) Fats (d) Water

44. **Small molecules of cytosol forms**
(a) True solution (b) Colloidal solution (c) Sol (d) Gel

45. **Large molecules of cytosol forms**
(a) True solution (b) Colloidal solution (c) Sol (d) Gel

46. **Nature of Sol is**
(a) Viscous (b) Non viscous (c) Both a and b (d) Semi-viscous

47. **Nature of Gel is**
(a) Viscous (b) Non viscous (c) Semi-viscous (d) All of them

48. **Cytoplasm is the site of**
(a) Glycolysis (b) Electron transport chain
(c) Krebs cycle (d) All of them

49. **Cytoplasm serves as store house of**
(a) Chemicals (b) Cell organelles (c) Both a and b (d) None of them

50. **Endoplasmic reticulum appears to be in contact with:**
(a) Cell membrane (b) Nuclear membrane (c) Both a and b (d) None of them

51. **Material of endoplasmic reticulum is separated from cytoplasmic material by**
(a) Plasma membrane (b) Nuclear membrane (c) Cisternae (d) None of them

52. **Shape of cisternae is**
(a) Spherical (b) Tubular (c) Both a and b (d) None of them

53. **Ribosomes are attached with**
(a) SER (b) RER (c) Both a and b (d) None of them

54. **Lipid metabolism is controlled by**
(a) SER (b) RER (c) Both a and b (d) None of them

55. **Protein synthesis is controlled by**
(a) SER (b) RER (c) Both a and b (d) None of them

56. **Ribosomes are composed of**
(a) RNA (b) Protein (c) Both a and b (d) Ribose sugar

RER (Rough Endoplasmic Reticulum)
SER (Smooth Endoplasmic Reticulum)

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57. **Amount of RNA and protein is similar in ribosome of**
(a) Prokaryotic cells (b) Eukaryotic cells (c) Both a and b (d) None of them

58. **Largest ribosomal unit sediments at**
(a) 40S (b) 60S (c) 80S (d) 70S

59. **The attachment of ribosomal subunits is controlled by**
(a) Ca^{++} (b) Fe^{++} (c) Mn^{++} (d) Mg^{++}

60. **mRNA and ribosomes collectively form**
(a) Mesosomes (b) Lysosomes (c) Polysomes (d) Nucleosomes

61. **Ribosome are synthesized in**
(a) Nucleus (b) Cytoplasm (c) Nucleolus (d) Golgi bodies

62. **Golgi apparatus consists of**
(a) Cisternae (b) Vesicles (c) Both a and b (d) None of them

63. **Vesicles of Golgi bodies are derived from**
(a) SER (b) RER (c) Mitochondria (d) Nucleus

64. **Cisternae are formed by process of**
(a) Binary Fission (b) Multiple Fission (c) Fusion (d) Budding

65. **Vesicles of Golgi complex is formed by process of**
(a) Binary Fission (b) Multiple fission (c) Fusion (d) Budding

66. **Cell secretions are produced by**
(a) Golgi bodies (b) Ribosomes (c) SER (d) RER

67. **Secretions are converted to finished product by**
(a) Golgi bodies (b) Ribosomes (c) SER (d) RER

68. **Carbohydrates are converted to glycolipids in**
(a) Ribosomes (b) Golgi bodies (c) Mitochondria (d) RER

69. **Process of digestion of foreign particle by cell is termed**
(a) Endocytosis (b) Pinocytosis (c) Phagocytosis (d) None of them

70. **Enzymes of lysosomes are synthesized by**
(a) Ribosomes (b) Golgi bodies (c) SER (d) RER

71. **Tay-sach's disease results in abnormal catabolism of**
(a) Carbohydrates (b) Proteins (c) Lipids (d) All of them

72. **Nature of enzymes of peroxisomes is**
(a) Hydratases (b) Carboxylases (c) Oxidative (d) All of them

73. **Characteristic product of peroxisomes is**
(a) NO_2 (b) CO (c) H_2O_2 (d) NO

74. **Glyoxisomes are present in**
(a) Plant (b) Animals (c) Both a and b (d) Yeasts

75. **Glyoxisomes convert fatty acids to**
(a) Proteins (b) Amines (c) Amides (d) Sugar

76. **Carbohydrates are obtained from fatty acid by**
(a) Glycolysis (b) Kreb's cycle (c) Glyoxalate cycle (d) All of them

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77. **Cell stores water and metabolic intermediates in**
(a) Nucleus (b) Mitochondria (c) Centriole (d) Vacoule

78. **Turgor of plant cell is controlled by**
(a) Nucleus (b) Mitochondria (c) Centriole (d) Vacoule

79. **Cilia are originated from**
(a) Microtubules (b) Microfilaments
(c) Intermediate filaments (d) All of them

80. **Amoeboid movement is controlled by**
(a) Microtubules (b) Microfilaments
(c) Intermediate filaments (d) All of them

81. **Shape of cell is determined by**
(a) Microtubules (b) Microfilaments
(c) Intermediate filaments (d) All of them

82. **Proteins present in microtubules are**
(a) Actin (b) Trypsin (c) Both a and b (d) Tubulin

83. **Protein present in microfilaments is**
(a) Actin (b) Myosin (c) Both a and b (d) Tubulin

84. **Number of microtubules present in a centriole are**
(a) 2 (b) 3 (c) 6 (d) 9

85. **Number of tubules present in each microtubule are**
(a) 2 (b) 3 (c) 6 (d) 9

86. **Number of centrioles present in a cell are**
(a) 2 (b) 3 (c) 6 (d) 9

87. **Centrioles are absent in**
(a) Animals (b) Microorganisms (c) Lower Plants (d) Higher plants

88. **Centriole controls formation of**
(a) Cilia (b) Flagella (c) Pseudopodia (d) All of them

89. **Energy for cell function is produced in**
(a) Nucleus (b) Cytoplasm (c) Mitochondria (d) All of them

90. **Number of membranes present in a mitochondrion are**
(a) 1 (b) 2 (c) 3 (d) 4

91. **Mitochondrial infoldings are termed as**
(a) Cisternae (b) Cristae (c) Polysomes (d) Buds

92. **Mitochondria is self-replicating due to presence of**
(a) DNA (b) Ribosomes (c) Both a and b (d) None of them

93. **Shape of F_1 particles is**
(a) Spherical (b) Triangular (c) Circular (d) Knob-like

94. F_1 particles arise from
(a) Mitochondrial Matrix (b) Cristae
(c) Outer membrane of mitochondria (d) All of them

95. Krebs cycle takes place in
(a) Cristae (b) Mitochondrial matrix
(c) Outer membrane of mitochondria (d) All of them

96. Animal cells lack
(a) Centriole (b) Spindles (c) Plastids (d) All of them

97. Green colour of chloroplasts is due to
(a) Chlorophyll (b) Chromophyll (c) Leucophyll (d) DNA

98. Central atom of chlorophyll is
(a) Fe^{++} (b) Ca^{++} (c) Mn^{++} (d) Mg^{++}

99. Part of chloroplast for trapping sunlight is
(a) Envelope (b) Stroma (c) Thylakoid (d) Granum

100. Colour of Granum is
(a) Green (b) Yellow (c) Brown (d) Blue

101. Thylakoid are surrounded by
(a) Stroma (b) Envelope (c) Granum (d) Inter-Granum

102. Granum is originated by arrangement of
(a) Envelope (b) Stroma (c) Thykaloid (d) Inter-granum

103. Chromoplasts are present in
(a) Ripened fruit (b) petals (c) Both a and b (d) Leaves

104. Pollination is facilitated by
(a) Chloroplasts (b) Chromoplasts (c) Leucoplasts (d) All of them

105. Colour of Leucoplasts is
(a) Green (b) Yellow (c) Brown (d) Colourless

106. Food of plants is stored in
(a) Chloroplasts (b) Chromoplasts (c) Leucoplasts (d) All of them

107. Leucoplasts are present in
(a) Leaves (b) Ripened fruit (c) Petals (d) Roots

108. Number of membranes present in a nuclear envelope are
(a) 1 (b) 2 (c) 3 (d) 4

109. Number of nuclear pore are greater in
(a) Differentiated cells (b) Undifferentiated cell
(c) Equal in both (d) Absent in both

110. Membrane of nucleolus is
(a) Well developed (b) Poorly developed
(c) Rudimentary (d) Absent

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111. **Precursors of ribosomal subunits are present in**
(a) Central region of nucleolus (b) Peripheral region of nucleolus
(c) Both a and b (d) Nucleoplasm

112. **rDNA are present in**
(a) Central region of nucleolus (b) Peripheral region of nucleolus
(c) Both a and b (d) Nuclear pores

113. **Nucleolus synthesizes and stores**
(a) rDNA (b) mRNA (c) rRNA (d) tRNA

114. **Nucleus is usually obtained with**
(a) Acidir dye (b) Basic dye (c) Neutral dye (d) All of them

115. **Chromosome is composed of**
(a) DNA (b) Proteins (c) Both a and b (d) Chrometids

116. **Genes are located on**
(a) Chromosomes (b) Ribosomes (c) Nucleosomes (d) Polysomes

117. **Number of chromosomes in frog cell are**
(a) 46 (b) 48 (c) 16 (d) 26

118. **Number of chromosomes in somatic cells are**
(a) n (b) 2n (c) 3n (d) 4n

119. **Number of chromosomes in sex cells are**
(a) n (b) 2n (c) 3n (d) 4n

120. **Prokaryotic cell lacks**
(a) Golgi bodies (b) Mitochondria
(c) Endoplasmic reticulum (d) All of them

121. **Size of prokaryotic ribosome is**
(a) 40S (b) 60S (c) 70S (d) 80S

122. **Prokaryotic cell divides by**
(a) Mitosis (b) Meiosis (c) Binary fission (d) Budding

123. **Cell wall of prokaryotic cell is composed of**
(a) Cellulose (b) Chitin (c) Murein (d) All of them

124. **Lysosomes are abundantly found in**
(a) Nerve cells (b) Muscle cells
(c) Phagocytic W.B.C. (d) Mesophyll cell of leaf

125. **De-Duve discovered**
(a) Lysosomes (b) Peroxisome (c) Both a and b (d) Ribosomes

ANSWERS

1.	a	2.	c	3.	a	4.	d	5.	d	6.	b	7.	d
8.	b	9.	a	10.	b	11.	c	12.	d	13.	c	14.	d
15.	a	16.	b	17.	c	18.	c	19.	a	20.	a	21.	c
22.	c	23.	a	24.	a	25.	b	26.	c	27.	a	28.	b
29.	b	30.	d	31.	d	32.	b	33.	d	34.	d	35.	c
36.	b	37.	b	38.	c	39.	a	40.	d	41.	c	42.	c
43.	d	44.	a	45.	b	46.	b	47.	a	48.	a	49.	c
50.	c	51.	c	52.	c	53.	b	54.	a	55.	b	56.	c
57.	b	58.	b	59.	d	60.	c	61.	c	62.	c	63.	a
64.	c	65.	d	66.	b	67.	a	68.	b	69.	c	70.	d
71.	c	72.	c	73.	c	74.	a	75.	d	76.	c	77.	d
78.	b	79.	a	80.	b	81.	c	82.	d	83.	c	84.	d
85.	b	86.	a	87.	d	88.	a	89.	c	90.	b	91.	b
92.	c	93.	d	94.	b	95.	b	96.	c	97.	a	98.	d
99.	d	100.	a	101.	a	102.	b	103.	c	104.	b	105.	d
106.	c	107.	d	108.	b	109.	b	110.	d	111.	b	112.	a
113.	c	114.	b	115.	c	116.	a	117.	d	118.	b	119.	a
120.	d	121.	c	122.	c	123.	c	124.	c	125.	c		

ENZYMES

1. Enzymes are _____ in nature.
   (a) Proteins (b) Carbohydrates (c) Fats (d) Vitamins
2. Enzymes are composed of
   (a) Monosaccharides (b) Disaccharides (c) Polysaccharides (d) Amino acids
3. Shape of an enzyme molecule is
   (a) Rod shaped (b) Globular (c) Spiral (d) Irregular
4. _____ is the substance to which enzyme is attached.
   (a) Reactant (b) Product (c) Substrate (d) None of them
5. Enzyme is attached to substrate at
   (a) Active site (b) Co – factor (c) Co - enzyme (d) Prosthetic group
6. Bridge between enzyme and substrate is formed by
   (a) Co - factor (b) Activator (c) Inhibitor (d) All of them
7. _____ is a metal ion co–factor.
   (a) Fe^{2+} (b) CO^{2+} (c) Zn^{2+} (d) All of them
8. The detachable co–factor is known as
   (a) Activator (b) Inhibitor (c) Prosthetic group (d) Coenzymes
9. Nature of an activator is
   (a) Organic ion (b) Inorganic ion (c) Both a and b (d) Protein
10. _____ is the non-protein part of an enzyme.
    (a) Co-factor (b) Prosthetic group (c) Coenzymes (d) All of them
11. Prosthetic group is bounded to enzyme by
    (a) Ionic bond (b) Covalent bond
    Co-ordinate covalent bond (d) Weak attractive linkage
12. Co–enzyme is attached to enzymes by
    (a) Ionic bond (b) Covalent bond
    (c) Co–ordinate covalent bond (d) Weak attractive linkage
13. Coenzymes are made up of
    (a) Proteins (b) Carbohydrates (c) Fats (d) Vitamins
14. An apoenzyme consists of
    (a) A polypeptide chain (b) Prosthetic group
    (c) Coenzyme (d) All of them
15. A holoenzyme consists of
    (a) A polypeptide chain (b) Prosthetic group
    (c) Coenzyme (d) All of them
16. Enzymes for photosynthesis are present in
    (a) Chloroplast (b) Chromoplast (c) Leucoplast (d) Centriole

17. **Enzymes for respiration are present in**
    (a) Golgi complex (b) Endoplasmic reticulum
    (c) Mitochondria (d) Ribosomes
18. **Enzymes for protein synthesis are present in**
    (a) Golgi complex (b) Endoplasmic reticulum
    (c) Mitochondria (d) Ribosome
19. **Effect of enzymes on the properties of end products is**
    (a) Extreme (b) Very small (c) No effect (d) All of them
20. **Action of enzymes is**
    (a) General (b) Specific (c) Both a and b (d) None of them
21. **Activation energy is _______ by enzymes.**
    (a) Increased (b) Decreased (c) Not changed (d) Both a and b
22. **Structure of enzymes is in _______ dimensions.**
    (a) One (b) Two (c) Three (d) No dimension
23. **Substrate is converted into ______ by an enzyme.**
    (a) Co - factor (b) Coenzymes (c) Prosthetic Group (d) Product
24. **Active sites of enzymes are**
    (a) Charged (b) Uncharged (c) Polar (d) Non polar
25. **Charge of active site is formed by**
    (a) Amino acids (b) Monosaccharides (c) Fats (d) Vitamins
26. **Shape of enzymes is formed by**
    (a) Amino acids (b) Monosaccharide (c) Fats (d) Vitamins
27. **Active site of enzymes is made up of**
    (a) Binding site (b) Catalytic site (c) Both a and b (d) None of them
28. **ES complex is formed by**
    (a) Co-factor (b) Coenzymes (c) Catalytic site (d) Binding site
29. **ES complex is converted into product by**
    (a) Co-factor (b) Coenzymes (c) Catalytic site (d) Binding site
30. **______ medium is required for enzymatic activity.**
    (a) Acidic (b) Basic (c) Salty (d) Aqueous
31. **Lock and key model is proposed by**
    (a) Emil Fischer (b) Koshland (c) Brown (d) Hooke
32. **Structure of active site is ____ according to Fischer's model.**
    (a) Elastic (b) Soft (c) Rigid (d) None of them
33. **Induce fit model was proposed by.**
    (a) Emil Fischer (b) Koshland (c) Brown (d) Hooke
34. **If concentration of enzymes is increased, then rate of reaction is**
    (a) Increased (b) Decreased (c) Constant (d) None of them
35. **If concentration of enzyme is increased, then number of active sites become**
    (a) Increased (b) Decreased (c) Constant (d) None of them

36. **The reaction rate is directly proportional to concentration of substrate at**
(a) Low conc. of enzyme (b) High conc. of enzyme
(c) Low conc. of substrate (d) High conc. of substrate

37. **The temperature at which efficiency of enzymes becomes maximum is called**
(a) Optimum temperature (b) Critical temperature
(c) Absolute temperature (d) None of them

38. **Optimum temperature of human body is**
(a) 98.6 °C (b) 37 °F (c) 37 °C (d) 100 °C

39. **Denaturation of enzyme means**
(a) apid activity of enzyme (b) Slow activity of enzyme
(c) Moderate activity of enzyme (d) Inactivity of enzyme

40. **pH at which enzyme has maximum efficiency is called is**
(a) Optimum pH (b) Critical pH (c) Absolute pH (d) None of them

41. **Optimum pH of catalase is**
(a) 9.7 (b) 9.0 (c) 7.5 (d) 7.6

42. **Optimum pH of Pancreatic lipase is**
(a) 4.5 (b) 5.5 (c) 6.5 (d) 9.0

43. **Optimum pH of sucrose is**
(a) 6.8 (b) 7.6 (c) 5.5 (d) 4.5

44. **Optimum pH of Anginase is**
(a) 2.0 (b) 9.7 (c) 9.0 (d) 5.5

45. **Optimum pH of chymotrypsin is**
(a) 4.5 (b) 5.5 (c) 7.5 (d) 6.8

46. **Optimum pH of Enterokinase is**
(a) 9.7 (b) 7.5 (c) 5.5 (d) 2.0

47. **Optimum pH of pepsin is**
(a) 4.5 (b) 2.0 (c) 3.7 (d) 2.6

48. **Optimum pH of salivary amylase is**
(a) 7.5 (b) 6.8 (c) 4.5 (d) 5.5

49. **Active site of enzyme is blocked by**
(a) Activator (b) Promoter (c) Inhibitor (d) All of them

50. **Example of an inhibitor is**
(a) Cyanide (b) Antibodies (c) Anti-metabolites (d) All of them

51. **Active site of enzyme is destroyed by**
(a) Reversible inhibitor (b) Irreversible inhibitor
(c) Competitive (d) Non-competitive

52. **Irreversible inhibitors are attached to active sites by**
(a) Ionic bond (b) Covalent bond
(c) Co-ordinate covalent bond (d) Weak linkages

53. **Reversible inhibitors are attached to active sites by**
(a) Ionic bond (b) Covalent bond
(c) Co-ordinate covalent bond (d) Weak linkages

54. Competitive inhibitors activate ______ site.
(a) Binding (b) Catalytic (c) Both a and b (d) None of them

55. Structure of enzyme is altered by ________ inhibitor.
(a) Competitive (b) Non-competitive (c) Both a and b (d) None of them

ANSWERS

1.	a	2.	d	3.	b	4.	c	5.	a	6.	a	7.	d
8.	a	9.	b	10.	d	11.	b	12.	d	13.	d	14.	a
15.	d	16.	a	17.	c	18.	d	19.	c	20.	b	21.	b
22.	c	23.	d	24.	a	25.	a	26.	a	27.	c	28.	d
29.	c	30.	d	31.	a	32.	c	33.	b	34.	a	35.	a
36.	c	37.	a	38.	c	39.	d	40.	a	41.	d	42.	d
43.	d	44.	b	45.	c	46.	c	47.	b	48.	b	49.	c
50.	d	51.	b	52.	b	53.	d	54.	a	55.	b		

KINGDOM PLANTAE

1. **Abundance of ferns is found in**
   (a) Plains (b) Shades (c) Water bodies (d) Tropics
2. **Sphenopsida includes**
   (a) Angiospermae (b) Gymnospermae (c) Both a and b (d) None of these
3. **Foliar sporangia are attached to**
   (a) Leaves (b) Stem (c) Both a and b (d) None of these
4. **Circinate vernation is found in**
   (a) Lycopsida (b) Sphenopsida (c) Pteropsida (d) None of these
5. **Tracheophytes include**
   (a) Hornworts (b) Horse tails (c) Mosses (d) Both a and b
6. **Transportation takes place in Bryophytes through**
   (a) Xylem (b) Phloem (c) Diffusion (d) Both a and b
7. **In Bryophytes gametophyte generation is**
   (a) Dominant (b) Recessive (c) Both a and b (d) Predominant
8. **In Bryophytes, male sex cells are termed as**
   (a) Antherozoids (b) Antheridia (c) Sperms (d) Archegonia
9. **Egg evolved due to heterogamy is**
   (a) Motile (b) Non motile (c) Partially motile (d) None of the above
10. **Paraphyses are**
    (a) Underground stems (b) Adventitious roots (c) Sterile hairs (d) Lealets
11. **Protonema resemles in structure to**
    (a) An alga (b) A fungus (c) A yeast (d) A mushroom
12. **Number of chromosomes in Oospore are**
    (a) 2n (b) n (c) 4n (d) 8n
13. **Spores are formed by the process of**
    (a) Mitosis (b) Meiosis (c) Binary fission (d) Multiple fission
14. **End of sporophyte generation takes place at**
    (a) Gametes (b) Gametophyte (c) Spore mother cells (d) Oospores
15. **Vascular tissue of Psilopsida is**
    (a) Narrow (b) Wide (c) Absent (d) Rudimentary
16. **Colour of gametophyte generation of Tmesipeteris is**
    (a) Green (b) Brown (c) Black (d) Colourless
17. **Mycorrhizal association is found between**
    (a) Tracheophytes and Bryophytes (b) Trachreophyte and Fungi
    (c) Trachcophtes and Alga (d) Fungi and Alga
18. **Function of rhizome is**
    (a) Anchorage (b) Absorption (c) Both a and b (d) None of them

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19. **Single undivided vein is present in**
(a) Microphyllous leaves
(b) Megaphyllous leaves
(c) Both a and b
(d) None of these

20. **In 'Overtopping' the pattern of development of various branches is**
(a) Equal (b) Unequal (c) Partially equal (d) Absent

21. **Webbing is done by a sheet of**
(a) Parenchymal cells
(b) Sclerenchymal cells
(c) Chlorenchymal cells
(d) Vascular tissue

22. **Most primitive leaf was evolved in**
(a) Mosses (b) Club mosses (c) Loverworts (d) Hornworts

23. **Joints are present in**
(a) Lycopsida (b) Sphenopsida (c) Pteropsida (d) All of them

24. **Sporophyte generation is always**
(a) Diploid (b) Monoploid (c) Triploid (d) Dominant

25. **Protection of stem is provided by**
(a) Ramenta (b) Ligule (c) Cuticle (d) Capsule

26. **Sorus is a group of**
(a) Sporangia (b) Sporangiophore (c) Sporophylls (d) Spores

27. **Dispersion of spores involves contraction of**
(a) Sporophylls (b) Annulus (c) Stomium (d) Ligule

28. **Prothallus plant body is present in**
(a) Sporophyte generation
(b) Gametophyte generation
(c) Both a and b
(d) None of them

29. **Shape of prothallus resembles**
(a) Heart (b) Kidney (c) Lung (d) Liver

30. **Growth of prothallus takes place at its**
(a) Anterior end (b) Posterior end (c) Medial end (d) Lateral end

31. **In monoecious plants, both male and female sex organs appear on**
(a) Same plant (b) Different plants (c) Both a and b (d) Absent

32. **Oosphere of Adiantum is present in**
(a) Stigma (b) Venter (c) Stalk (d) Ligule

33. **Protective covering of Ovule is provided by**
(a) Integument (b) Capsule (c) Sporophylls (d) Ramenta

34. **Male gametophyte is produced from**
(a) Microspore (b) Megaspore (c) Oospore (d) All of above

35. **Functional megaspores within the megasporangium are**
(a) One (b) Two (c) Four (d) Eight

36. **Pollen is captured by megasporangium by modification of its**
(a) Proximal end (b) Distal end (c) Dorsal end (d) Ventral end

37. **The structure absent in Gymnosperm is**
(a) Ovule (b) Megasporophylls (c) Ovary (d) All of them

38. Pollen are transported in Pinus by the means of
(a) Water (b) Wind (c) Insects (d) All of them

39. Female gametophyte is formed form functional megaspore by the process of
(a) Mitosis (b) Meiosis (c) Budding (d) None of them

40. Total number of chromosomes in functional megaspore are
(a) n (b) 2n (c) 1/2 n (d) 4n

41. After fertilization ovule is converted to
(a) Zygote (b) Embryo (c) Seed (d) Egg

42. Seeds are formed in
(a) Angiospermae (b) Gymnospermae (c) Both a and b (d) None of them

43. Angiosperms produce
(a) Fruits (b) Seeds (c) Flowers (d) All of them

44. Fruits are formed from
(a) Ovary (b) Ovule (c) Seed (d) Cones

45. Nucleus is present in
(a) Ovary (b) Ovule (c) Sepal (d) Stamen

46. Number of cells in male gametophyte of angiosperm are
(a) Five (b) Seven (c) Three (d) Nine

47. Number of cells in female gametophyte of angiosperm are
(a) Five (b) Seven (c) Three (d) Nine

48. Endosperm forms as a result of
(a) Fertilization (b) Double fertilization
(c) Metosis (d) Meosis

49. Integuments of Ovule are converted to form
(a) Testa (b) Protonema (c) Nucleus (d) Endosperm

50. Number of chromosomes in endosperm are
(a) n (b) 2n (c) 3n (d) 4n

51. Sepals of rose family are
(a) Free (b) United at base (c) United at apex (d) Rudimentary

52. Number of stamens in didynamous condition is
(a) 2 (b) 4 (c) 6 (d) 8

53. Tobacco is obtained from family
(a) Rosacae (b) Solanaceae (c) Fabaceae (d) Poaceae

54. The anterior petals of fabaceae are termed as
(a) Standard (b) Vexillum (c) Wings (d) Carina

55. Skin diseases are cured by using leaves of
(a) Cassia alata (b) Cassia senna (c) Cassia obovata (d) Cassia fistula

56. In acacia family stipules are modified to
(a) Petiole (b) Pedicel (c) Thorns (d) Legume

57. Spikelets are arranged along
(a) Rachilla (b) Glumes (c) Awns (d) Palea

58. Floret consists of
(a) Flower (b) Lemma (c) Palea (d) All of them

59. One kind of spores are produced by the phenomenon of
(a) Homospory (b) Heterospory (c) Meiosis (d) Mitosis

60. Two kind of spores are produced by the phenomenon of
(a) Homospory (b) Heterospory (c) Meiosis (d) Mitosis

61. Life on land is better adapted in
(a) Liverworts (b) Hornworts (c) Mosses (d) Ferns

62. Nutritionally self-supporting generation of moss is
(a) Sporophyte (b) Gametophyte (c) Both a and b (d) None of them

63. A heterosporous plant gives origin to
(a) Male gametophyte (b) Female gametophyte
(c) Both a and b (d) None of them

64. Male gametophyte of the angiosperm is
(a) Microspore (b) Embryo Sac
(c) Anther (d) Germinated pollen grain

65. Pollen grains are present inside the
(a) Pollen sac (b) Embryo Sac (c) Testa (d) Fruit

66. Number of chromosomes in secondary nucleus of female gametophyte of angiosperm are
(a) n (b) 2n (c) 3n (d) 4n

67. Oospore is formed as a result of
(a) Fertilization (b) Mitosis (c) Meiosis (d) Germination

68. Chief food stuff of mankind is obtained from family
(a) Solanaceae (b) Fabaceae (c) Gramineae (d) Mimosaceae

69. False indusium is present in
(a) Filicineae (b) Gymnospermae (c) Angiospermae (d) Mimosaceae

70. Haploid chromosomes are found in
(a) Megaspore (b) Microspore (c) Prothallus (d) All of them

ANSWERS

1.	d	2.	d	3.	a	4.	c	5.	b	6.	c	7.	a
8.	a	9.	b	10.	c	11.	a	12.	a	13.	b	14.	c
15.	a	16.	d	17.	b	18.	c	19.	a	20.	b	21.	a
22.	b	23.	b	24.	a	25.	a	26.	a	27.	b	28.	b
29.	a	30.	a	31.	a	32.	b	33.	a	34.	a	35.	a
36.	b	37.	c	38.	b	39.	a	40.	a	41.	c	42.	c
43.	d	44.	a	45.	b	46.	c	47.	b	48.	b	49.	a
50.	c	51.	b	52.	b	53.	b	54.	d	55.	a	56.	c
57.	a	58.	d	59.	a	60.	b	61.	b	62.	b	63.	c
64.	d	65.	a	66.	b	67.	a	68.	c	69.	a	70.	c

THE CHROMOSOMES AND DNA

1. **Who first observed chromosomes inside the nucleus?**
   (a) Mendel (b) Walther Fleming (c) Sutton (d) None of them
2. **When chromosomes were observed?**
   (a) 1881 (b) 1882 (c) 1883 (d) None of them
3. **Chromosomes were first discovered in**
   (a) Salamander Larvae (b) Human (c) Frog Larvae (d) None of them
4. **How many chromosomes are present in corn?**
   (a) 29 (b) 28 (c) 20 (d) None of them
5. **How many chromosomes are present in penicillium?**
   (a) 1 (b) 2 (c) 100 (d) 10
6. **The particular array of chromosomes that an individual possesses is called**
   (a) Karyotype (b) Karyokinesis (c) Cytokinesis (d) None of them
7. **Which of the following has centromere at one end?**
   (a) Telocentric (b) Acrocentric (c) Metacentric (d) Sub-metacentric
8. **What % age of DNA is present in chromosomes?**
   (a) 40% (b) 60% (c) 20% (d) 80%
9. **A typical human chromosome contains about___nucleotides in its DNA.**
   (a) 140 millions (b) 1.4×10^8 (c) 1400 millions (d) Both a and b
10. **The amount of information, which one chromosome contains, would fill about _____ printed books.**
    (a) 1000 (b) 280 (c) 2800 (d) 100
11. **When single chromosome is laid out in a straight line it would be about _____ long.**
    (a) 5 cm (b) 5 mm (c) 50 cm (d) 500 cm
12. **For every 200 nucleotides, the DNA duplex is coiled around a core of _______ histone proteins.**
    (a) 8 (b) 18 (c) 10 (d) None of them
13. **Which of the following amino acid is present in histone molecule in large amount?**
    (a) Arginine (b) Lysine (c) Methionine (d) Both a and b
14. **Phosphate groups of the DNA are**
    (a) +vely charged (b) –vely charged (c) Neutral (d) None of the
15. **Histone core acts as**
    (a) Magnetic form (b) Negative form (c) Positive form (d) Neutral form
16. **When the string of nucleosomes wraps up into higher order coils then what happens?**
    (a) Further coiling occurs (b) Coiling stops
    (c) Uncoiling of string (d) None of them
17. **Highly condensed portions of the chromatin are called**
    (a) Euchromatin (b) Heterochromatin (c) Both a and b (d) None of them

18. Who first suggested the central role of chromosomes?
(a) Sutton (b) Hutton and Lyell (c) Karl Correns (d) Both a and b

19. Chromosome pairs with one another during
(a) Meiosis (b) Mitosis (c) Budding (d) None of them

20. Who first formulated chromosomal theory of inheritance?
(a) Walter Sutton (b) Mendel (c) Walthyer (d) Karl Correns

21. Walter Sutton was ______ scientist.
(a) American (b) German (c) Japanese (d) None of them

22. Sperm contains little amount of
(a) Yolk (b) Cytoplasm (c) Nucleus (d) None of them

23. In ______, Thomas Hunt Morgan studied the fruit fly.
(a) 1910 (b) 1900 (c) 1901 (d) 1902

24. When mutant male is crossed with normal female, all F_1 progeny had
(a) White eye (b) Red eye (c) Pink eye (d) Both a and b

25. How many white eyed flies were studied in 4252 progeny?
(a) 784 (b) 782 (c) 786 (d) None of them

26. According to Mendel traits of Drosophila assort
(a) Independently (b) Dependently (c) Didn't assort (d) None of them

27. Who gave first evidence of hereditary nature of DNA?
(a) Sutton (b) Waldyer (c) Frederick Griffith (d) None of them

28. Through smooth type pneumonia, mice
(a) Remained alive (b) Died (c) Becanie ill (d) None of them

29. The agent responsible for transforming streptococcus was discovered in
(a) 1944 (b) 1844 (c) 1865 (d) None of them

30. Transforming principle was proposed by
(a) Oswald Avery (b) Colin Macleod (c) Maclyn McCarty (d) All of them

31. Avery's conclusion was provided in
(a) 1950 (b) 1852 (c) 1952 (d) None of them

32. Friedrich Miescher was a ______ scientist.
(a) German (b) Japanese (c) American (d) None of them

33. Friedrich Miescher discovered DNA in
(a) 1869 (b) 1889 (c) 1769 (d) None of them

34. Who extracted the white substance from the nuclei of human cells and fish sperm?
(a) Sutton (b) Miescher (c) Walther Fleming (d) All of them

35. For how many years, biologists did little research on the nucleic acid?
(a) 60 years (b) 50 years (c) 70 years (d) None of them

36. The basic structure of nucleic acid was determined by the biochemist
(a) Miescher (b) Sutton (c) P.A. Levene (d) None of them

37. In a nucleotide, nitrogen base is attached to ______ of pentose sugar.
(a) Carbon number 1 (b) Carbon number 3 (c) Carbon number 5 (d) None of them

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38. **Hydroxyl group is attached to the ______ atom of a pentose sugar.**
(a) 2 Carbon (b) 3 Carbon (c) 5 carbon (d) None of them

39. **Who showed that the amount of adenine in DNA always equals the amount of thymine?**
(a) Erwin Chargaff (b) Erwin Schrodinger (c) Sutton (d) All of them

40. **A ______ chemist Rosalind Franklin carried on an X–ray diffraction analysis of DNA.**
(a) German (b) British (c) American (d) None of them

41. **DNA molecule had a shape of a helix with a diameter of**
(a) 2 nm (b) 2 mm (c) 2 cm (d) None of them

42. **Complete helical turn appears after every**
(a) 3.4 cm (b) 3.4 nm (c) 3.4 mm (d) None of them

43. **Who worked out on structure of the DNA molecule?**
(a) James Watson (b) Franklin (c) Francis Crick (d) Both a and c

44. **Purines and Pyrimidines molecules have constant diameter of**
(a) 4 nm (b) 2 nm (c) 4 mm (d) 2 mm

45. **Guanine form ______ hydrogen bonds with cytosine.**
(a) Two (b) Three (c) Four (d) None of them

46. **______ will not form proper hydrogen bonds with cytosine.**
(a) Adenine (b) Guanine (c) Thymine (d) All of them

47. **______ will always occur in the same proportion in any DNA molecule.**
(a) Adenine and thymine (b) Adenine and Guanine
(c) Cytosine and thymine (d) None of them

48. **"The parental double helix would remain intact and generate DNA copies consisting of entirely new molecules" is**
(a) Replication model (b) Conservative model
(c) Semi conservative model (d) None of them

49. **The three hypothesis of DNA replication were evaluated by**
(a) Mathew Meselson (b) Franklin Stahl (c) Franklin Mathew (d) Both a and b

50. **Where three hypothesis of DNA replication were evaluated?**
(a) Cambridge University (b) California Institute of Technology
(c) Oxford University (d) None of them

51. **Bacteria were grown in a medium containing heavy isotopes of**
(a) N^{15} (b) N^{14} (c) N^{13} (d) None of them

52. **Who transferred the bacteria from the N^{15} medium to the N^{14} medium and collected the DNA at various intervals?**
(a) Meselson (b) Stahl (c) Michelson (d) Both a and b

53. **In Meselson-Stahl experiment DNA was dissolved in**
(a) Calcium chloride (b) Cesium chloride
(c) Aluminium chloride (d) None of them

54. **N^{15} strands are ______ than N^{14} strands.**
(a) Rarer (b) Denser (c) Thicker (d) None of them

55. **How many chromosomes are present in sugar cane?**
(a) 60 (b) 20 (c) 80 (d) None of them

56 **How many chromosomes are present in honeybee?**
(a) 50 (b) 65 (c) 32 (d) 30

Who confirmed Watson and Crick model?
(a) Meselson (b) Stahl (c) Sutton (d) Both a and b

How many DNA polymerases are present in bacteria?
(a) Two (b) Three (c) Four (d) None of them

59. **Which of the following play supporting role in DNA replication of bacteria?**
(a) DNA polymerase I (b) DNA polymerase II
(c) DNA Polymerase III (d) All of them

60. **Which of the following enzymes is 10 times larger and far more complex in structure?**
(a) DNA polymerase I (b) DNA polymerase II
(c) DNA polymerase III (d) All of them

61. **Two parents strands of a DNA molecules are**
(a) Parallel (b) Antiparallel (c) Side to side (d) None of them

62. **How much long is Okazaki fragment in eukaryotes?**
(a) 1000–2000 nucleotides (b) 100–200 nucleotides
(c) 150–200 nucleotides (d) None of them

63. **How much long is Okazaki fragment in prokaryotes?**
(a) 1000–2000 nucleotides (b) 100–200 nucleotides
(c) 150–200 nucleotides (d) None of them

64. **Who concluded that certain diseases among their patients were more prevalent in particular families?**
(a) A. Garrod (b) W. Bateson (c) Sutton (d) Both a and b

65. **George Beadle and Edward Tatum both were**
(a) Geneticists (b) Chemists (c) Physicists (d) None of them

66. **The small change in the structure of DNA is called**
(a) Mutation (b) Mutant (c) Allelic change (d) None of them

67. **Beadle and Tatum placed subcultures of individual fungal cells on a**
(a) Maximal medium (b) Minimal Medium (c) Both a and b (d) None of them

68. **Who described the complete sequence of amino acids of Insulin?**
(a) Sanger (b) Beadle (c) Tatum (d) Garrod

69. **Frederick Sanger was ______ biochemist.**
(a) American (b) Japanese (c) Chinese (d) English

70. **When molecular basis of sickle cell anemia was discovered?**
(a) 1956 (b) 1958 (c) 1856 (d) 1858

71. **In sickle cell anemia, Glutamic acid converts the position to**
(a) Valine (b) Ornithine (c) Citruline (d) Arginine

72. **The sequence of nucleotides that determines the amino acid sequence of a protein is called**
(a) Chromosome (b) Allele (c) Gene (d) None of them

73. **Which of the following come first from proline in normal hemoglobin beta Bchain?**
(a) Threonine (b) Leucine (c) Histidine (d) None of them

74. **Transfer of information from DNA to RNA which occurs when a mRNA copy of the gene is produced. This is called**
(a) Transduction (b) Transformation (c) Transcription (d) None of them

75. **During translation, ___ provides the site where polypeptides are assembled.**
(a) mRNA (b) tRNA (c) rRNA (d) None of them

76. **How many kinds of tRNA are present in human cells?**
(a) 40 (b) 45 (c) 450 (d) None of them

77. **One of the two strands of DNA is transcribed, the strand is called**
(a) Template (b) Antisense (c) Coding (d) Both a and b

78. **Coding Strand is also called**
(a) Template Strand (b) Antisense Strand (c) Sense Strand (d) None of them

79. **How many types of RNA are present in prokaryotes which are responsible for the synthesis of all three kinds of RNAs?**
(a) One (b) Two (c) Three (d) Four

80. **Transcription starts at the RNA polymerase binding site called ______ on the DNA template strand.**
(a) Promoter (b) Code (c) Anticode (d) Both b and c

81. **What TTGACA sites in prokaryotes are called?**
(a) 10 – sequence (b) 35 – sequence (c) 37 – sequence (d) None of them

82. **10-sequence in prokaryote is**
(a) TTGACA (b) TATGCA (c) TATAAT (d) TGAACT

83. **The binding of RNA polymerase to the promoter is ______ step in gene transcription.**
(a) First (b) Second (c) Third (d) Fourth

84. **GC base pair is followed by**
(a) AC (b) AT (c) GA (d) None of them

85. **The U–ribonucleotide causes RNA polymerase to stop**
(a) Transcription (b) Synthesis (c) Transduction (d) None of them

86. **Where mRNA is released in bacteria?**
(a) Nucleus (b) Ribosome (c) Cytoplasm (d) None of them

87. **7 methyl GTP is linked ______ with the first nucleotide.**
(a) $3'$ to $5'$ (b) $5'$ to $3'$ (c) $5'$ to $5'$ (d) $3'$ to $3'$

88. **How many nucleotides are present in genetic code?**
(a) Two (b) Three (c) Four (d) None of them

89. **There are three nucleotides in**
(a) Anticodon (b) Codon (c) Both a and b (d) None of them

90. **How many kinds of amino acids are present?**
(a) 20,000 (b) 2000 (c) 20 (d) 3000

91. **Who tested 65 codons by making artificial mRNAs?**
(a) Crick (b) Mendel
(c) M. Nirenberg, P. Leader, H.G. Khorana (d) None of them

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92. **When full genetic code was determined?**
(a) 60's (b) 70's (c) 80's (d) None of them

93. **Which of the following are called nonsense codon?**
(a) UAA, UAG, UGA (b) UAA, UGC, UGC (c) UTA, UAA (d) None of the

94. **Is genetic code same in almost all the organisms?**
(a) No (b) Yes (c) May be (d) None of them

95. **Which of the following showed that genetic code is not universal?**
(a) Ribosomal DNA (b) Ribosomal RNA
(c) Mitochondrial DNA (d) Mitochondrial RNA

96. **UGA codon is ______ codon.**
(a) Stop (b) Sense (c) Nonsense (d) None of them

97. **In mitochondria UGA reads as**
(a) Arginine (b) Glycine (c) Aspartate (d) Tryptophan

98. **In ______, translation begins when the initial portion of mRNA molecules binds to rRNA.**
(a) Eukaryotes (b) Prokaryotes (c) Both a and b (d) None of them

99. **Modified methionine is also called**
(a) N–formyl methionine (b) M–formyl methionine
(c) Unmodified methionine (d) None of them

100. **For UAA antiocdon is**
(a) AUU (b) ACG (c) AGG (d) None of them

101. **The cells of eukaryotes contain an enormous amount of**
(a) DNA (b) RNA (c) mRNA (d) tRNA

102. **If the DNA in all of the cells of an adult human were lined up end to end what is the distance from Earth to Jupiter?**
(a) 60 times the 100 million kilometer (b) 60 times the 100 kilometer
(c) 60 times the 100 billion kilometer (d) None of them

103. **Mutations can broadly be classified as**
(a) Chromosomal aberration (b) Gene aberration
(c) Point mutation (d) Both a and c

104. **Chromosomal aberration lead to**
(a) Down's syndrome (b) Klinefelter's syndrome
(c) Both a and b (d) None of them

105. **Point mutations are**
(a) Chromosomal changes (b) Mutational changes
(c) Both a and b (d) None of them

106. **Alternation involves only one or a few base pairs in the coding sequence which is called**
(a) Chromosomal change (b) Mutational change
(c) Point mutation (d) None of them

107. **Which of the following is the well known example of point mutation?**
(a) Down's syndrome (b) Sickle cell anemia (c) Phenylketonuria (d) Both b and c

108. **Loss of one or a few base is called**
(a) Insertion (b) Deletion (c) Both a and b (d) Point mutation

109. **Substitution of one or a few base is called**
(a) Base substitution (b) Deletion (c) Point mutation (d) None of them

110. **Phenylalanine consequently accumulates in the cells leading to**
(a) Sexual disorder (b) Mental retardation
(c) Chromosomal disorder (d) None of them

ANSWERS

1.	b	2.	b	3.	a	4.	c	5.	a	6.	a	7.	a
8.	a	9.	d	10.	b	11.	a	12.	a	13.	d	14.	b
15.	a	16.	a	17.	b	18.	c	19.	a	20.	a	21.	a
22.	b	23.	a	24.	b	25.	b	26.	a	27.	c	28.	b
29.	a	30.	d	31.	c	32.	a	33.	a	34.	b	35.	b
36.	c	37.	a	38.	b	39.	a	40.	b	41.	a	42.	b
43.	b	44.	b	45.	b	46.	a	47.	a	48.	b	49.	b
50.	b	51.	a	52.	d	53.	b	54.	b	55.	c	56.	c
57.	d	58.	b	59.	a	60.	a	61.	b	62.	b	63.	a
64.	d	65.	a	66.	a	67.	b	68.	a	69.	d	70.	a
71.	a	72.	c	73.	a	74.	c	75.	c	76.	b	77.	d
78.	c	79.	a	80.	a	81.	b	82.	c	83.	a	84.	b
85.	d	86.	c	87.	c	88.	b	89.	b	90.	c	91.	c
92.	a	93.	a	94.	b	95.	c	96.	a	97.	d	98.	b
99.	a	100.	a	101.	a	102.	c	103.	d	104.	c	105.	b
106.	c	107.	d	108.	d	109.	a	110.	b				

VARIATION AND GENETICS

1. **The basic unit of biological information is**
(a) Gene (b) Chromosome (c) Allele (d) All of them

2. **The position of the gene on the chromosome is called**
(a) Position (b) Locality (c) Habitat (d) Locus

3. **Two alleles on one locus can be**
(a) Identical (b) Different (c) Both a and b (d) None of them

4. **What is called the appearance of trait?**
(a) Genotype (b) Phenotype (c) Both a and b (d) None of them

5. **Colour of the flower is called**
(a) Trait (b) Phenotype (c) Genotype (d) None of them

6. **Red and white colours of the flowers are called as**
(a) Trait (b) Phenotype (c) Genotype (d) None of them

7. **Jumping genes _____ settle peacefully on their loci.**
(a) Do not (b) Do (c) Can (d) None of them

8. **The group of sexually interbreeding organism of the same species that exist together in both time and space is called**
(a) Gene pool (b) Population (c) Both a and b (d) None of them

9. **All the genes or alleles found in a breeding population at a given time are collectively called**
(a) Gene pool (b) Population (c) Both a and b (d) None of them

10. **What is the total genetic information encoded in a total genes in a breeding population existing at a given time?**
(a) Gene pool (b) Population (c) Both a and b (d) None of them

11. **Who laid the foundation of classical genetics by formulating two laws of hereditary?**
(a) G. J. Mendel (b) George Anthony (c) Aristotle (d) None of them

12. **Pisum Sativum is a biological name of**
(a) Sweet pea (b) Garden pea (c) Carrot (d) None of them

13. **The flowers of garden pea are**
(a) Unisexual (b) Bisexual (c) Hermaphrodite (d) None of them

14. **How many pairs of garden pea are focused by Mendel?**
(a) Two (b) Five (c) Seven (d) Nine

15. **When the alleles of a gene pair in an organism is same then organism is called**
(a) Heterozygous (b) Homozygous (c) Both a and b (d) None of them

16. **When the two alleles of a gene pair in an organism is different than organism is called**
(a) Heterozygous (b) Homozygous (c) Both a and b (d) None of them

17. **In Mendel's law of segregation, phenotypic ratio is**
(a) 3:1 (b) 1:3 (c) 1:2:1 (d) None of them

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18. **What is the genotypic ratio in Mendel's law of segregation?**
(a) 3:1 (b) 1:2:1 (c) 1:3 (d) None of them

19. **Law of segregation was proposed by**
(a) W.S, Sutton (b) Waldyer (c) Mendel (d) None of them

20. **The law in which when an individual showing a dominant genotype is crossed with an individual showing its recessive phenotype is called**
(a) Law of Segregation (b) Test Cross
(c) Law of Independent Assortment (d) None of them

21. **Homozygous or heterozygous nature of the phenotype is found out by**
(a) Law of Segregation (b) Test Cross
(c) Law of Independent Assortment (d) None of them

22. **What generation is produced when RR and rr is crossed?**
(a) RR (b) rr (c) Rr (d) None of them

23. **What generation is produced when Rr and rr is crossed?**
(a) Rr, rr (b) rr, RR (c) Both a and b (d) None of them

24. **9/16 ratio in Mendel's law of independent assortment is for**
(a) Round yellow (b) Round green (c) Wrinkled yellow (d) Wrinkled green

25. **3/16 ratio in Mendel's law of independent assortment is for**
(a) Round green (b) Wrinkled yellow (c) Both a and b (d) None of them

26. **1/16 ratio in Mendel's law of independent assortment is for**
(a) Round yellow (b) Round green (c) Wrinkled yellow (d) Wrinkled green

27. **The location of gene on chromosome is always**
(a) Ordinary (b) Specific (c) Changing (d) None of them

28. **Pea has seven ______ pairs of chromosome.**
(a) Homologous (b) Heterozygous (c) Homozygous (d) None of them

29. **Mendel studied seven characters of pea in ____ homologous pair of chromosomes.**
(a) Same (b) Different (c) Both a and b (d) None of them

30. **Mendel presented his findings to Brunn Society for the study of Natural Science in**
(a) 1862 (b) 1863 (c) 1864 (d) 1865

31. **Mendel's work was published in the proceedings of the Society in**
(a) 1865 (b) 1866 (c) 1867 (d) None of them

32. **Mendel's work was neglected for about ______ years.**
(a) 31 (b) 32 (c) 33 (d) 34

33. **After Mendel's death, who acknowledged or rediscovered his work?**
(a) Correns (b) De Varies (c) Tschermach (d) All of them

34. **Albinism is a ______ trait in humans.**
(a) Dominant (b) Recessive (c) Both a and b (d) None of them

35. **How many types of dominance relations are there among alleles?**
(a) Two (b) Three (c) Four (d) Five

36. **The contrasting pairs of alleles for all the seven characters chosen by Mendel, showed**
(a) Complete dominance (b) Incomplete dominance

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(c) Co-dominance (d) Over dominance

37. **When one allele is completely dominant over the other, presence of the recessive allele is functionally hidden, This is**
(a) Complete dominance (b) Incomplete dominance
(c) Co-dominance (d) Over dominance

38. **Who worked on flowering plant named 4 O'clock in 1899?**
(a) Carl Charles (b) Carl Cornes (c) Mendel (d) None of them

39. **When the phenotype of heterozygous is intermediate between phenotype of the two homozygous then it is called**
(a) Complete dominance (b) Incomplete dominance
(c) Co-dominance (d) Over dominance

40. **In 4 O'clock flowering plant when red flower is crossed with white flower, the generation produced is**
(a) Pink (b) White (c) Red (d) None of them

41. **Different alleles of a gene that are both expressed in a heterozygous condition are called**
(a) Complete dominant (b) Incomplete dominant
(c) Co-dominant (d) Over dominant

42. **Who discovered MN blood types in man?**
(a) Landsteiner (b) Levine (c) Both a and b (d) None of them

43. **There are three general phenotypes in MN blood group that are**
(a) M,N,MN (b) M,N, NN (c) MN, M, MM (d) None of them

44. **If a man of M blood group marries a woman of N blood group then all the children will have _____ blood group.**
(a) MN (b) M (c) N (d) None of them

45. **♂ is the sign used for**
(a) Female reproductive organ (b) Male reproductive organ
(c) Both a and b (d) None of them

46. **♀ is the sign use for**
(a) Female reproductive organ (b) Male reproductive organ
(c) Both a and b (d) None of them

47. **All such alternative form of genes whose number is more than two is called**
(a) Dominant alleles (b) Recessive alleles (c) Multiple alleles (d) None of them

48. **Who explained the genetic basis of ABO blood types?**
(a) Bernstein (b) Landsteiner (c) Levine (d) None of them

49. **When the genetic basis of ABO system was proposed?**
(a) 1924 (b) 1925 (c) 1926 (d) 1927

50. **A person neither having antigen A nor Antigen B has blood group**
(a) A (b) B (c) O (d) None of them

51. **How many multiple alleles of ABO blood group are there?**
(a) Two (b) Three (c) Four (d) None of them

52. A and B antigen can also be present in ______ and other body fluids.
(a) Saliva (b) Blood (c) Bile pigment (d) None of them

53. The modern ______ finger printing test is more seriously considered for a legal decision
(a) RNA (b) DNA (c) m RNA (d) None of them

54. Mr. And Mrs. Bilal both have blood group A. Their child would be
(a) O (b) B (c) Both a and b (d) None of them

55. Mr. Haris has blood group A and Mrs. Haris has blood group AB their child would be
(a) O (b) B (c) A (d) None of them

56. Rh factor is named after
(a) Rhesus Monkey (b) Rhesus Bear (c) Rhesus Donkey (d) None of them

57. When Rh antigen was discovered?
(a) 1927 (b) 1928 (c) 1929 (d) 1930

58. Who first discovered Rh antigen?
(a) Bernstein (b) Levine (c) Landsteiner (d) None of them

59. Rh blood group system is encoded by how many genes?
(a) Three (b) Four (c) Five (d) None of them

60. When an Rh^- woman marries to an Rh^+ man, they conceive a child who would be
(a) Rh^- (b) Rh^+ (c) Both a and b (d) None of them

61. Mother and foetus have connection in the uterus through
(a) Pipe (b) Placenta (c) Vein (d) None of them

62. The interaction between different genes occupying different loci is called as
(a) Epistasis (b) Dominance (c) Both a and b (d) None of them

63. Relationship between alleles of the same gene occupying the same locus is called
(a) Epistasis (b) Dominance (c) Both a and b (d) None of them

64. ABO locus is on which of the chromosome.
(a) 8th (b) 19^{th} (c) 10th (d) 9th

65. On which of the chromosome H locus is present?
(a) 8th (b) 19^{th} (c) 10th (d) 9th

66. Bombay phenotype results from
(a) Epistasis (b) Pleiotropy (c) Both a and b (d) None of them

67. Genes that affect growth rate in humans, also influence
(a) Weight (b) Height (c) Both a and b (d) None of them

68. In cats, the dominant allele W makes fur
(a) Black (b) Brown (c) White (d) None of them

69. In cats, melanocyte failure causes
(a) White fur (b) Deafness (c) Both a and b (d) None of them

70. Phenotype expression of traits has ______ aspects.
(a) Qualitative (b) Quantitative (c) Both a and b (d) None of them

71. Qualitative difference in phenotypic expression of traits is
(a) Large (b) Small (c) Middle (d) None of them

72. **Environmental variation makes the distribution of phenotypes more**
(a) Rough and continuous (b) Smooth and rough
(c) Smooth and continuous (d) None of them

73. **Human skin colour is**
(a) Qualitative trait (b) Quantitative trait (c) Both a and b (d) None of them

74. **What will be the colour of the skin when the number of pigments specfying the genes are greater?**
(a) Brown (b) White (c) Dark (d) None of them

75. **What is more complex polygenic trait?**
(a) Skin colour (b) Human height (c) Both a and b (d) None of them

76. **What would be the height when large number of alleles of height are present in man?**
(a) Short (b) Tall (c) Moderate (d) None of them

77. **For Gigantism, how many alleles are required?**
(a) Large number (b) Small number (c) Moderate number (d) None of them

78. **Rolling of tongue is due to**
(a) Dominant gene (b) Recessive gene (c) Both a and b (d) None of them

79. **Rolling of tongue is due to ______ dominant gene.**
(a) Single (b) Double (c) Triple (d) None of them

80. **The staying together of all the genes of chromosome is called**
(a) Gum (b) Link (c) Linkage (d) None of them

81. **Linked genes don't obey**
(a) Law of Segregation (b) Law of Independent Assortment
(c) Both a and b (d) None of them

82. **Gene linkage ______ the chances of genetic recombination and variation among off springs.**
(a) Maximizes (b) Minimizes (c) Moderates (d) None of them

83. **Crossing over is an exchange of segments between ______ chromatids of homologous chromosomes during meiosis.**
(a) Sister (b) Non-sister (c) Both a and b (d) None of them

84. **How homologous chromosomes pair up lengthwise?**
(a) Point to point (b) Locus to locus (c) Both a and b (d) None of them

85. **Crossing over occurs at ______ stage between non-sister chromatids.**
(a) 3 – standard (b) 4-standard (c) 5 – standard (d) None of them

86. **The search for mechanism of inheritance of sex started after discovery of Mendel's work in**
(a) 1901 (b) 1902 (c) 1900 (d) 1906

87. **Drosophila melanogaster is a biological name of**
(a) Fruit fly (b) Bee (c) Mosquito (d) None of them

88. **X and Y chromosomes are called**
(a) Sex chromosomes (b) Autosomes (c) Sex linkage (d) None of them

89. **______ don't carry any sex determine gene.**
(a) Sex chromosomes (b) Autosomes (c) Both a and b (d) None of them

90. **SRY is the _____ determining gene.**
(a) Female (b) Male (c) Hermaphrodites (d) None of them

91. **In which of the following form of pairs Ascaris incurva has 42 chromosomes?**
(a) 8 pairs along 13 pairs of autosomes (b) 9 pairs, 12 pairs
(c) 7 pairs with 14 pairs (d) None of them

92. **A gamete without any sex chromosome is called**
(a) Nill gamete (b) Nullo gamete (c) Both a and b (d) None of them

93. **_____ is smaller in size with black rounded abdomen.**
(a) Male drosophila (b) Female drosophila (c) Both a and b (d) None of them

94. **_____ is larger with pointed abdomen.**
(a) Male drosophila (b) Female drosophila (c) Both a and b (d) None of them

95. **Drosophila has generation time of**
(a) One week (b) Three week (c) Two week (d) Four week

96. **Who observed white eyed mutant male fly?**
(a) Calvin Bridges (b) Mendel (c) Sutton (d) None of them

97. **The gene for eye colour is located on**
(a) X chromosome (b) Y chromosome (c) Both a and b (d) None of them

98. **There is no allele for the trait on**
(a) X Chromosome (b) Y chromosome (c) Both a and b (d) None of them

99. **X linked trait are commonly referred as**
(a) Sex linkage (b) Sex linked trait (c) Both a and b (d) None of them

100. **Who discovered the sex linked inheritance?**
(a) Mendel (b) Sutton (c) Morgan (d) None of them

101. **When T.H. Morgan was awarded a Nobel prize for his contributions of genetics?**
(a) 1931 (b) 1932 (c) 1933 (d) 1934

102. **_____ chromosome is not completely inert.**
(a) X chromosome (b) Y chromosome (c) Both a and b (d) None of them

103. **In humans, haemophilia and colour blindness are**
(a) Dominant (b) Recessive (c) Both a and b (d) None of them

104. **In humans, hypophosphatemic or Vitamin D resistant rickets are**
(a) Dominant (b) Recessive (c) Both a and b (d) None of them

105. **Experimental matings are not practically possible in**
(a) Bats (b) Rats (c) Humans (d) All of them

106. **_____ is a rare X linked recessive trait.**
(a) Haemophilia. (b) Colour Blindness (c) Both a and b (d) None of them

107. **Red blindness is named as**
(a) Protanopia (b) Deuteranopia (c) Tritanopia (d) All of them

108. **What is blue blindness called**
(a) Protanopia (b) Deuteranopia (c) Tritanopia (d) All of them

109. **Green blindness is named as**
(a) Protanopia (b) Deuteranopia (c) Tritanopia (d) None of them

110. _____ is a true blindness
(a) Tritanopia (b) Monochromacy (c) Deuteranopia (d) Protanopia

111. Dietary Rickets is controlled by
(a) Vitamin A (b) Vitamin B (c) Vitamin C (d) Vitamin D

112. A heterozygous female
(a) Can be bald (b) Cannot be bald (c) May be bald (d) None of them

113. A woman can be bald when she will be
(a) Homozygous (b) Heterozygous (c) Both a and b (d) None of them

114. _____ is an example of multifactorial trait.
(a) Blood pressure (b) Jaundice (c) Fever (d) All of them

115. A sudden change in the structure of gene is called
(a) Change in structure (b) Change in gene
(c) Mutation (d) All of them

116. What is non-Insulin dependent?
(a) Diabetes Mellitus type I (b) Diabetes mellitus type II
(c) Both a and b (d) None of them

117. In how many Diabetic patients, Diabetes mellitus type II is present?
(a) 70% (b) 80% (c) 90% (d) 100%

118. About _____ of Diabetes mellitus type II get the disease early in life before 25 years of age.
(a) 2% – 5% (b) 3% – 7% (c) 2% – 6% (d) None of them

119. About _____ of cases of MODY are caused by mutations in Glucokinase gene
(a) 50% (b) 60% (c) 70% (d) 80%

120. With how many genes human skin colour is controlled?
(a) 3–6 (b) 2–6 (c) 3–7 (d) None of them

121. What is the maximum height of garden pea?
(a) 6 – 7 feet (b) 6 – 8 feet (c) 7 – 8 feet (d) None of them

122. The minimum height of Garden pea is
(a) 9 – 18 feet (b) 9 – 18 inches (c) 9 – 18 cm (d) None of them

123. The blood serum containing antibodies is called
(a) Serum (b) Antiserum (c) Blood serum (d) None of them

124. The _____ allele "h" cannot insert sugar molecule to glycoprotein.
(a) Dominant (b) Homozygous (c) Recessive (d) None of them

125. The quantitative variations are _____ and less striking.
(a) Small (b) Large (c) Moderate (d) None of them

126. Who studied the genetics of wheat grain colour?
(a) Mendel (b) W.S. Sutton (c) Nilsson Ehle (d) None of them

127. How many gene pairs contribute to the wheat grain colour?
(a) One (b) Two (c) Three (d) Four

128. Who discovered WZ, ZZ type?
(a) Mendel (b) J. Seiler (c) Marian John (d) None of them

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129. **XX, XY type was discovered in**
(a) 1914 (b) 1918 (c) 1920 (d) None of them

130. **Who discovered that pollens of certain plants were sex determining?**
(a) Correns (b) J. Seiler (c) Mendel (d) None of them

131. **Many species of _______ microorganism don't have sex chromosome**
(a) Eukaryotic (b) Prokaryotic (c) Both a and b (d) None of them

132. **When XX woman marries with colour blind man X^cY then the chances that their children would be**
(a) 25% colour blind (b) 50% colour blind (c) 75% colour blind (d) None of them

133. **Morgan and his colleagues studied pattern of inheritance of more than _______ traits of Drosophila.**
(a) 86 (b) 87 (c) 85 (d) None of them

134. **For X^HX^M, X^HX^h, X^HY, X^hY we identify that their parents can be**
(a) X^HY, X^HX^h (b) X^hY, X^hX^h (c) X^HY, X^hX^h (d) None of them

135. **For about how many years, pisum sativum was under experiment in Mendel's monastery garden?**
(a) 12 (b) 9 (c) 11 (d) None of them

ANSWERS

1.	a	2.	d	3.	c	4.	b	5.	a	6.	b	7.	a
8.	b	9.	a	10.	a	11.	a	12.	b	13.	c	14.	c
15.	b	16.	a	17.	a	18.	b	19.	c	20.	b	21.	b
22.	c	23.	a	24.	a	25.	c	26.	c	27.	c	28.	a
29.	b	30.	d	31.	b	32.	d	33.	d	34.	b	35.	c
36.	a	37.	a	38.	b	39.	d	40.	a	41.	c	42.	c
43.	a	44.	a	45.	b	46.	a	47.	c	48.	a	49.	b
50.	c	51.	b	52.	a	53.	b	54.	a	55.	b	56.	a
57.	d	58.	c	59.	a	60.	b	61.	b	62.	a	63.	b
64.	d	65.	b	66.	a	67.	c	68.	c	69.	c	70.	c
71.	a	72.	c	73.	b	74.	c	75.	b	76.	a	77.	b
78.	a	79.	a	80.	c	81.	a	82.	b	83.	b	84.	c
85.	b	86.	c	87.	a	88.	a	89.	b	90.	b	91.	a
92.	b	93.	a	94.	b	95.	c	96.	a	97.	a	98.	b
99.	b	100.	c	101.	c	102.	b	103.	b	104.	a	105.	c
106.	a	107.	a	108.	c	109.	b	110.	b	111.	d	112.	b
113.	a	114.	a	115.	c	116.	b	117.	c	118.	a	119.	a
120.	a	121.	a	122.	b	123.	b	124.	c	125.	a	126.	c
127.	c	128.	b	129.	a	130.	a	131.	a	132.	a	133.	c
134.	a	135.	c										

GROWTH AND DEVELOPMENT

1. **The progressive changes which are undergone before an organism acquires its adult's form constitute**
   (a) Life cycle (b) Growth
   (c) Embryonic development (d) None of them
2. **Plant growth and development involve**
   (a) Cell division (b) Elongation of cells in tissue
   (c) Difference of cells in tissues (d) All of them
3. **Growth is an _____ in size.**
   (a) Irreversible increase (b) Irreversible decrease
   (c) Reversible increase (d) Reversible decrease
4. **A plant has a growth pattern which is called**
   (a) Closed growth (b) Open growth (c) Both a and b (d) None of them
5. **In _____, growth occurs through the activity of meristems.**
   (a) Land plants (b) Marine plants (c) Vascular plants (d) All of them
6. **Meristems are young tissues or cells that retain the potential to**
   (a) Divide (b) Grow (c) Both a and b (d) None of them
7. **Apical Meristems play important role in**
   (a) Secondary growth (b) Primary growth (c) Tertiary growth (d) None of them
8. **_____ play role in the production of leaves and flowers.**
   (a) Primary meristems (b) Lateral meristems
   (c) Intercalary meristems (d) Apical meristems
9. **Lateral Meristems are present in**
   (a) Dicots (b) Monocots (c) Both a and b (d) None of them
10. **_____ are the example of lateral meristems.**
    (a) Vascular cambium (b) Cork cambium (c) Both a and b (d) None of them
11. **_____ play role in the increase in diameter of stem and root.**
    (a) Intercalary meristems (b) Lateral meristems
    (c) Apical meristems (d) Meristems
12. **How many types of growth are present in plants?**
    (a) Two (b) Four (c) Six (d) Many
13. **Growth of _____ plant is divided into four phases.**
    (a) Unicellular (b) Bicellular (c) Multicellular (d) None of them
14. **During cell division, the number of cells increase by**
    (a) Meiosis (b) Mitosis (c) Simple cell division (d) None of them
15. **Cell division occurs at the tip of**
    (a) Shoot (b) Root (c) Both a and b (d) Leaves
16. **Zone of elongation is only of**
    (a) Few millimetres in length (b) Few millimetres in breath
    (c) Both a and b (d) None of them

17. **The growth rate is influenced by**
(a) External factor (b) Internal factor (c) Both a and b (d) None of them

18. **Temperature influences the rate of growth within**
(a) .. 36°C (b) 0 – 20°C (c) 0 – 35°C (d) 0 – 40°C

19. **The optimum temperature for maximum growth of plant is**
(a) 26 – 30°C (b) 25 – 30°C (c) 24 – 30°C (d) 20 – 40°C

20. **______ in intensity of light increases number of cell division.**
(a) Decrease (b) Increase (c) Both a and b (d) None of them

21. **______ light favours elongation of cells.**
(a) Red (b) Blue (c) White (d) None of them

22. **______ light enhances cell division.**
(a) Red (b) White (c) Blue (d) None of them

23. **Without ______, no metabolic activity is possible.**
(a) Carbon Dioxide (b) Oxygen (c) Both a and b (d) Nitrogen

24. **Without ______, the process of photosynthesis does not take place.**
(a) Carbon dioxide (b) Oxygen (c) Both a and b (d) None of them

25. **Which one is the plant Hormone?**
(a) IAA (b) Indole 3 acetic acid (c) Both a and b (d) Acetic acid

26. **______ supplies energy for growth of plants.**
(a) Vitamin (b) Water (c) Hormone (d) Nutrition

27. **Vitamins are ______ compounds.**
(a) Inorgranic (b) Organic (c) Both a and b (d) None of them

28. **______ controls the development of lateral buds.**
(a) Active root apex (b) Active shoot apex (c) Leaves (d) None of them

29. **The removal of apex which releases the lateral buds from apical dominance is called**
(a) Inhibitory effects (b) Compensatory effects
(c) Correlation (d) All of them

30. **Which one can play role in apical dominance?**
(a) Auxin (b) Cytokinins (c) Both a and b (d) None of them

31. **Development is an ordered sequence of ______ step.**
(a) Reversible (b) Irreversible (c) Growth (d) Division

32. **During ______, zygote is divided.**
(a) Fertilization (b) Gastrulation (c) Cleavage (d) Growth

33. **During organogenesis, ______ of cells occurs.**
(a) Body organ formation (b) Cell interaction
(c) Differentiation (d) All of them

34. **Germ layers are formed in**
(a) Fertilization (b) Gastrulation (c) Cleavage (d) Growth

35. **Incubators are usually regulated at temperature between**
(a) 36 – 38°C (b) 35 – 40°C (c) 38 – 39°C (d) 40 – 41°C

36. **Cleavage results in the formation of**
(a) Blastula (b) Gastrula (c) Morulla (d) Embryo

37. **_____ is characterized by the movement and rearrangement of cells in embryo.**
(a) Organogenesis (b) Cleavage (c) Growth (d) Gastrulation

38. **Blastoderm splits into _____ layers.**
(a) Three (b) Two (c) Four (d) Five

39. **Peripheral part of blastoderm where the cells lie un-separated from the yolk is termed as**
(a) Area opaca (b) Area pellucida (c) Epiblast (d) Hypoblast

40. **Primitive streak represents the _____ lips of blastopore.**
(a) Dorsal (b) Lateral (c) Both a and b (d) None of them

41. **The continuous migration of cells takes place between**
(a) Epiblast and Hypoblast (b) Primitive streak
(c) Lateral and dorsal sides (d) None of them

42. **After the formation of primitive streak, _____ is well established.**
(a) Ectoderm (b) Endoderm (c) Mesoderm (d) Hensen's node

43. **The lateral plate mesoderm is splitted into two sheet like layers of**
(a) Somatic mesoderm (b) Splanchnic mesoderm
(c) Both a and b (d) None of them

44. **The cavity formed between somatic and splanchnic mesoderm is**
(a) Blastocode (b) Blastopore (c) Blastoderm (d) Coelom

45. **In chicks of _____ hours, neural plate was seen as a flat, thickened area of ectoderm.**
(a) 19 (b) 20 (c) 22 (d) 18

46. **In embryos of _____ hours, a longitudinal folding has occurred.**
(a) 22 - 24 (b) 21 – 22 (c) 19 - 20 (d) 18 - 19

47. **_____ end of the neural groove is widest and forms the future brain.**
(a) Posterior (b) Anterior (c) Both a and b (d) None of them

48. **_____ produces larval epidermis.**
(a) Yellow cytoplasm (b) Gray vegetal cytoplasm
(c) Clear Cytoplasm (d) Gray equatorial cytoplasm

49. **_____ cytoplasm gives rise to gut.**
(a) Clear (b) Yellow (c) Gray vegetal (d) Gray equatorial

50. **_____ cytoplasm gives rise to muscle cells.**
(a) Clear (b) Yellow (c) Gray vegetal (d) Gray equatorial

51. **Which one produces notochord and neural tube?**
(a) Grey vegetal (b) Gray equatorial (c) Clear (d) Yellow

52. **_____ contains all the genes.**
(a) Nucleus (b) Cytoplasm (c) Both a and b (d) Mesoderm

53. **_____ plays the role of selection of gene.**
(a) Nucleus (b) Cytoplasm (c) Both a and b (d) Ectoderm

54. **Cytoplasmic components are ____ distributed within the egg.**
(a) Equally (b) Unequally (c) Completely (d) None of them

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55. **Aging is ______ changes.**
(a) Negative physiological (b) Positive physiological
(c) New (d) Growth

56. **The human life span is judged to be maximum of____ years.**
(a) 120 - 135 (b) 120 – 145 (c) 120 - 125 (d) 120 - 150

57. **Spontaneous mutation may result in**
(a) Loss of cells (b) Degeneration of tissues
(c) Both a and b (d) Elastic tissues degeneration

58. **Due to simple organization, ______ possess great power of regeneration.**
(a) Sponges (b) Arthropoda (c) Algea (d) Fungi

59. **Growth rate is influenced by**
(a) Hormones (b) Vitamin (c) Water (d) All of them

60. **Example of regeneration is**
(a) Healing of fracture (b) Repair of skin (c) Wound repairing (d) All of them

61. **Teratology deals with the study of**
(a) Normal development (b) Abnormal development
(c) Regeneration (d) Aging

62. **Abnormalities are due to**
(a) Chromosomes (b) Genes
(c) Environmental factors (d) All of them

63. **In haemophilia, only ______ suffer from abnormality.**
(a) Females (b) Males (c) Children (d) All of them

64. **How many chromosomes are missing during chromosomal abnormalities?**
(a) Two (x,x) (b) One (x or y) (c) Four (d) Two (y, y)

65. **In Microcephaly, the individuals are born with**
(a) Large skull (b) Small skull (c) Medium skull (d) None of them

ANSWERS

1.	c	2.	d	3.	a	4.	b	5.	a	6.	a	7.	b
8.	c	9.	b	10.	c	11.	b	12.	a	13.	c	14.	b
15.	c	16.	a	17.	c	18.	c	19.	b	20.	b	21.	a
22.	c	23.	b	24.	a	25.	c	26.	d	27.	b	28.	b
29.	b	30.	c	31.	b	32.	c	33.	b	34.	d	35.	a
36.	c	37.	b	38.	b	39.	a	40.	c	41.	a	42.	b
43.	c	44.	d	45.	d	46.	b	47.	b	48.	c	49.	c
50.	b	51.	b	52.	a	53.	b	54.	b	55.	a	56.	c
57.	c	58.	a	59.	d	60.	d	61.	b	62.	d	63.	b
64.	b	65.	b										

ECOSYSTEM

1. **The term "Ecology" has been derived from**
(a) Latin words (b) Greek words (c) English words (d) French words
2. **The term "Ecologic" was first time introduced by**
(a) Erust Haeckel (b) Darwin (c) Wallace (d) De Dove
3. **Environment includes**
(a) Physical components only (b) Biological components only
(c) Both physical and biological components (d) Air around us
4. **The major unit of ecology is**
(a) Population (b) Community (c) Ecosystem (d) None of them
5. **The ecosystem consists of ____ basic interacting components.**
(a) 1 (b) 2 (c) 3 (d) 4
6. **A group of interbreeding individuals is called**
(a) Population (b) Species (c) Community (d) Biomass
7. **All populations within an ecosystem are known as**
(a) Population group (b) Community (c) Biomass (d) Ecosystem
8. **Major regional ecological community of plants and animals form**
(a) Ecosystem (b) Biomes (c) Biomass (d) Population
9. **The actual location of place where an organism lives is called**
(a) Home (b) Native land (c) Habitat (d) None of them
10. **Who proposed the term niche for the first time?**
(a) Erust Haeckel (b) Joseph Proust (c) Joseph Grinnell (d) None of them
11. **A person who studies ecosystem is called**
(a) Ethnologist (b) Ornithologist (c) Gerontologist (d) Ecologist
12. **A person who studies animal behaviour is called**
(a) Ethologist (b) Gerontologist (c) Ornithologist (d) Ecologist
13. **A person who studies about aging phenomenon is called**
(a) Ethnologist (b) Gerontologist (c) Ornithologist (d) Ecologist
14. **The ultimate distributional unit within which a species is restrained by the limitations of its physical structure and physiology is called**
(a) Niche (b) Habitat (c) Biome (d) None of them
15. **Who described niche as the species occupation?**
(a) Charles Eton (b) Erust Haeckel (c) Joseph Grinnell (d) None of them
16. **In the ecosystem, the word "Eco" is related to**
(a) Biotic components (b) Environment (c) Air (d) None of them
17. **In the ecosystem, the word "System" is related to**
(a) Collection of related parts that work as unit (b) Environment
(c) A-biotic components (d) None of them

18. The air around the earth is
(a) A-biotic component (b) A-biotic component
(c) Both a and b (d) None of them

19. The fungi and other micro – organisms are included in
(a) Biotic components (b) A-biotic components
(c) Both a and b (d) None of them

20. Soil is placed in an ecosystem as
(a) Biotic components (b) A-biotic components
(c) Both a and b (d) None of them

21. The various kinds of organisms that inhabit an ecosystem make up
(a) The family (b) The study of (c) Ecosystem (d) Environment

22. The term "Oikos" means
(a) The family (b) The study of (c) Ecosystem (d) Environment

23. The term "Logy" means
(a) The study of (b) The family (c) Ecosystem (d) None of them

24. The study of relationship of living organisms to their environments in called
(a) Synecology (b) Autecology (c) Ecology (d) None of them

25. When a single population relationship to its environment is studied then it is called
(a) Autecology (b) Synecology (c) Ecology (d) None of them

26. The study of different communities with respect to environment is called
(a) Autecology (b) Synecology (c) Ecology (d) None of them

27. While studying the community, we come across _____ levels of integration.
(a) Two (b) Three (c) Four (d) Ten

28. The region in and around the earth in which whole life exist is called
(a) Atmosphere (b) Lithosphere (c) Biosphere (d) None of them

29. The air around the earth in ecological terms is called
(a) Atmosphere (b) Lithosphere (c) Biosphere (d) Hydrosphere

30. The water in the earth in ecological terms is called
(a) Biosphere (b) Lithosphere (c) Atmosphere (d) Hydrosphere

31. The soil of the earth is called
(a) Lithosphere (b) Hydrosphere (c) Atmosphere (d) Biosphere

32. All green photosynthetic plants are called
(a) Consumer (b) Decomposers (c) Producers (d) None of them

33. The only source of energy in the planet earth is
(a) Plants (b) Animals (c) Producers (d) Sun

34. All the organisms which are dependent on producers for their energy needs are called
(a) Plants (b) Consumers (c) Producers (d) None of them

35. The fungi and bacteria are known as
(a) Producers (b) Consumers (c) Decomposers (d) None of them

36. All animals directly or indirectly depend upon _____ for their food
(a) Plants (b) Bacteria (c) Fungi (d) None of them

37. **The organism which are involved in the decay of dead animal and plants are called**
(a) Producers (b) Consumers (c) Decomposers (d) None of them

38. **Which one of the following organism is capable of manufacturing organic food from inorganic substances?**
(a) Animal (b) Plant (c) Fungi (d) Bacteria

39. **The animals which eat flesh of other animals are called**
(a) Herbivores (b) Carnivores (c) Omnivores (d) None of them

40. **The animals which eat green plants are called**
(a) Herbivores (b) Carnivores (c) Omnivores (d) None of them

41. **The animals which feed on both animals and plants are called**
(a) Herbivores (b) Carnivores (c) Omnivores (d) None of them

42. **Lion is an**
(a) Herbivore (b) Omnivore (c) Carnivore (d) None of them

43. **Humans are included in**
(a) Herbivores (b) Carnivores (c) Omnivores (d) None of them

44. **Which one of the fallowing animals is an omnivore?**
(a) Lion (b) Cat (c) Crow (d) Sparrow

45. **The combination of many food chains form**
(a) Food cycle (b) Food web (c) Food circle (d) None of them

46. **Producers are included in**
(a) First trophic level T_1 (b) Second trophic level T_2
(c) Third trophic level T_3 (d) Fourth trophic level T_4

47. **Primary consumers are included in**
(a) First trophic level T_1 (b) Second Trophic level T_2
(c) Third trophic level T_3 (d) Fourth trophic level T_4

48. **Tertiary consumers are included in**
(a) First trophic level T_1 (b) Second trophic level T_2
(c) Third trophic level T_3 (d) Fourth trophic level T4

49. **Secondary consumers are included in**
(a) First trophic level T_1 (b) Second trophic level T_2
(c) Third trophic level T_3 (d) Fourth trophic level T_4

50. **The change in the community structure of an ecosystem over a period of time is called**
(a) Progression (b) Succession (c) Recession (d) None of them

51. **Succession begins by a few invaders is called**
(a) Beginrers (b) Pioneers (c) Starters (d) All of them

52. **Succession of dry land takes**
(a) Three major forms (b) Seven major forms (c) Two major forms (d) None of them

53. **Primary succession may start in a pond is called**
(a) Hydrosere (b) Derosere (c) Xerosere (d) None of them
54. **Primary succession may start in a dry soil or rocks called**
(a) Hydrosere (b) Derosere (c) Xerosere (d) None of them
55. **If primary succession start in a dry habitat, then this will be called**
(a) Hydrosere (b) Derosere (c) Xerosere (d) None of them
56. **Crustose refers to**
(a) Lifeful land structure (b) Highly developed ecosystem
(c) Primary succession (d) Land lifeless structure
57. **Foliage lichen stage is the ______ stage of succession.**
(a) First (b) Second (c) Third (d) Fourth
58. **Moss stage is the ______ stage of succession.**
(a) First (b) Second (c) Third (d) Fourth
59. **The climax forest is the ______ stage of ecosystem.**
(a) First stage (b) Second stage (c) Third stage (d) Final stage
60. **The animal that preys other animals is called**
(a) Killer (b) Preyer (c) Predator (d) Attacker
61. **The animal that is caught and eaten by the predator is called**
(a) Prey (b) Praying animal (c) Pray (d) None of them
62. **The process of eating of prey by the predator is called**
(a) Parasitism (b) Predation (c) Symbiosis (d) Mutualism
63. **Which one of the following statements is true?**
(a) The sizes of predators and prey populations are not related to each other
(b) The size of predators and prey populations are related to each other
(c) Prey is not affected by the predators
(d) Predators do not affect prey
64. **Diseases in living organisms caused by parasites are called**
(a) Infestations (b) Infections (c) Inflammation (d) None of them
65. **Which one of the following statements is true?**
(a) Parasites always harm the host (b) Parasites do not harm the host
(c) Parasites may or may not harm the host (d) None of them
66. **The parasites living inside the body of host are called**
(a) Endoparasites (b) Living parasites (c) Ectoparasites (d) None of them
67. **The parasite living outside the body of host are called**
(a) Endoparasites (b) Ectoparasites (c) Both a and b (d) None of them
68. **The tapeworm in the intestine of man is an example of**
(a) Ectoparasite (b) Endoparasite (c) Prey (d) Predator

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69. **Fungi causing dandruff in hair is an example of**
(a) Ectoparasite (b) Endoparasite (c) Prey (d) Predators

70. **Association between two organisms which brings benefit to both the organisms is called**
(a) Mutualism (b) Parasitism (c) Symbiosis (d) Commensalism

71. **The association between the roots of plants and fungi is called**
(a) Mutualism (b) Mycorrhiza (c) Phycorrhiza (d) None of them

72. **Lichens are an example of**
(a) Parasitism (b) Predation (c) Mutalism (d) Symbiosis

73. **The relationship between insects and flowering plants is an example of**
(a) Predation (b) Parasitism (c) Mutualism (d) Symbiosis

74. **The association of alga living within a fungus mycelium is termed as**
(a) Lichens (b) Predation (c) Mycorrhiza (d) None of them

75. **The type of relationship in which only onc organism is benefited, other is not harmed or benefited is called**
(a) Predation (b) Parasitism (c) Commensalism (d) Mutualism

76. **Sharks may have small fishes attached to them, these fishes are called**
(a) Rahoo (b) Remoras (c) Mallee (d) None of them

77. **The relation of sharks with remoras is termed as**
(a) Mutualism (b) Predation (c) Commensalisms (d) None of them

78. **The eating of grass by herbivores is called**
(a) Churning (b) Grazing (c) Grassing (d) None of them

79. **The final result of over – grazing is**
(a) Totally barren land (b) Succession (c) Progression of land (d) None of them

80. **Moderate grazing is**
(a) Very harmful to land (b) Harmful to ecosystem
(c) Helpful to ecosystem (d) None of them

81. **The nutrients which are required by the organisms in large amount are called**
(a) Macronutrients (b) Micronutrients (c) Excessive nutrients (d) Essential nutrients

82. **The nutrients which are not required by the animals in large amount are called**
(a) Non–essential nutrients (b) Essential nutrients
(c) Micronutrients (d) Macronutrients

83. **The chief reservoir of nitrogen is**
(a) Animals (b) Plants (c) Atmosphere (d) Land

84. **Nitrogen makes up _______ % of the gases in atmosphere.**
(a) 22 (b) 78 (c) 80 (d) 4

85. **Which one of the following statements is true?**
(a) Living organism can use nitrogen directly by the atmosphere
(b) Living organism cannot use elemental atmospheric nitrogen

(c) Animals can use nitrogen of air to form proteins
(d) None of them

86. The process by which limited amount of nitrogen is circulated through living organisms is called
(a) Natural cycle (b) Carbondioxide cycle
(c) Nitrogen cycle (d) A and C only

87. The stages of nitrogen cycle are
(a) Ammonification and nitrification
(b) Ammonification, nitrification and rectification
(c) Ammonification, nitrification and assimilation
(d) Nitrification only

88. The oxidation of ammonium ions by the bacteria in soil is called
(a) Ammonification (b) Nitrification (c) Assimilation (d) Rectification

89. Utilization of atmospheric nitrogen by certain plants by using bacteria is called
(a) Ammonia fixation (b) Nitrogen fixation (c) Nitration (d) None of them

90. In the process of assimilation
(a) Nitrates are oxidized again (b) Nitrates are reduced to amino acids
(c) Nitrates are reduced to ammonium ions (d) None of them

91. The total amount of energy fixed by the plants is called
(a) Total primary production (b) Gross primary production
(c) Gross final production (d) None of them

92. The amount of energy left after utilization by plants is called
(a) Gross secondary production (b) Biomass
(c) Biome (d) None of them

93. About ______% of the solar energy is trapped by producers.
(a) 15% (b) 1% (c) 0.5 % (d) None of them

94. The minimum energy is utilized by
(a) Producers (b) Consumers (c) Decomposers (d) All of them

95. The living organisms which can prepare their own food are
(a) Predators (b) Parasites (c) Producers (d) Prey

96. Parasites are included in
(a) Producers (b) Decomposers (c) Consumers (d) None of them

97. Bacteria and fungi are
(a) Producers (b) Decomposers (c) Consumers (d) None of them

98. Bear and human are included in
(a) Producers (b) Consumers (c) Decomposers (d) None of them

99. Mango tree is a
(a) Producer (b) Yellow plant (c) Xeroseric plant (d) None of them

100. Remoras is the name of
(a) Fish (b) Bird (c) Plant (d) None of them

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ANSWERS

1.	b	2.	a	3.	c	4.	b	5.	b	6.	b	7.	b
8.	b	9.	c	10.	c	11.	d	12.	a	13.	b	14.	a
15.	a	16.	b	17.	a	18.	b	19.	a	20.	b	21.	b
22.	a	23.	a	24.	c	25.	a	26.	b	27.	b	28.	c
29.	a	30.	d	31.	a	32.	c	33.	d	34.	b	35.	c
36.	a	37.	c	38.	d	39.	b	40.	a	41.	c	42.	c
43.	c	44.	c	45.	b	46.	a	47.	b	48.	d	49.	b
50.	b	51.	b	52.	c	53.	a	54.	d	55.	c	56.	d
57.	b	58.	b	59.	d	60.	c	61.	a	62.	b	63.	b
64.	a	65.	c	66.	a	67.	b	68.	b	69.	a	70.	c
71.	b	72.	c	73.	c	74.	a	75.	c	76.	b	77.	c
78.	b	79.	a	80.	c	81.	a	82.	c	83.	c	84.	b
85.	b	86.	c	87.	c	88.	b	89.	b	90.	c	91.	d
92.	b	93.	b	94.	c	95.	c	96.	b	97.	b	98.	b
99.	a	100.	a										

BIOTECHNOLOGY

1. Mendel's work was discovered in
(a) 1902 (b) 1913 (c) 1901 (d) 1900

2. In 1980, biotechnology had produced ______ to cure human illnesses.
(a) Drugs (b) Vaccines (c) Both a and b (d) None of them

3. There are ______ possible ways to get the gene of interest.
(a) Three (b) Four (c) Five (d) Six

4. First restriction enzyme was isolated by
(a) H.O. Smith (b) Goldsmith (c) Mendel (d) None of them

5. How many enzymes are isolated so far?
(a) 300 (b) 400 (c) 500 (d) 600

6. ______ is a commonly used restriction enzyme which cuts double standard DNA.
(a) $ECOR_1$ (b) $ECOR_2$ (c) Both a and b (d) None of them

7. For the preparation of a recombinant DNA, the plasmid is cut with the ______ enzyme.
(a) Different (b) Same (c) Another (d) None of them

8. The two different pieces of DNA joined together are known as
(a) Recombinant DNA (b) Chimaeric DNA (c) Both a and b (d) None of them

9. A genomic library is a collection of
(a) Bacterial clones (b) Bacteriophage clones
(c) Both a and b (d) None of them

10. Vectors may be
(a) Plasmids (b) Viruses (c) Both a and b (d) None of them

11. Probe can be
(a) Radioactive (b) Fluorescent (c) Both a and b (d) None of them

12. Polymerase chain reaction was developed by
(a) Kary B. Mullis (b) Charles Mullis (c) Both a and b (d) None of them

13. Polymerase chain reaction was developed in
(a) 1982 (b) 1983 (c) 1884 (d) 1984

14. Bacterium Thermus aequaticus lives in
(a) Cold springs (b) Hot springs (c) Winter (d) Summer

15. How many methods are used for the generation of different sized DNA fragment?
(a) One (b) Two (c) Three (d) Four

16. The method in which dideoxyribon ucleoside triphosphates are used to terminate DNA synthesis at different sites is called
(a) Sanger's method (b) Maxam-1 Gilbert method
(c) Both a and b (d) None of them

17. The method in which DNA threads chemically cut into pieces of different sizes is called
(a) Sanger's method (b) Maxam-1 Gilbert method
(c) Both a and b (d) None of them

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18. **One of the smallest human chromosome is**
(a) 21 (b) 22 (c) 23 (d) 24

19. **The human genome is ______ larger than any other genome sequenced so far.**
(a) 23 times (b) 24 times (c) 25 times (d) 26 times

20. **Genetically _____ have been used to clean up environmental pollutants.**
(a) Engineered Viruses (b) Engineered bacteria (c) Both a and b (d) None of them

21. **Millions of copies of single gene can be created through**
(a) Laser (b) PCR
(c) TCR (d) Genetic Engineering

22. **PCR takes its name from**
(a) DNA polymerase (b) RNA polymerase (c) DNA Replication (d) Both b and c

23. **DNA polymerase used in temperature insensitive, is extracted from the bacterium**
(a) Nitrosomonas (b) Nitrobacterium (c) Thermus aquaticus (d) None of them

24. **The process in which fragments can be separated according to their lengths is called**
(a) Electrophoresis (b) Gel electrophoresis
(c) Genetic Engineering (d) None of them

25. **The DNA from a ___ sperm is enough to identify a suspected rapist.**
(a) Single (b) Double (c) Triple (d) None of them

26. **PCR amplification and analysis can be used**
(a) To diagnose viral infection (b) To identify criminals
(c) To diagnose genetic disorder (d) All of above

27. **When gene sequencing method was developed?**
(a) 1970 (b) 1980 (c) 1870 (d) None of them

28. **The method in which didcoxyribon ucleocide triphosphate are used to terminate DNA synthesis is called**
(a) Sanger's method (b) Maxam method (c) Gilbert method (d) All of them

29. **Genetic engineering may enhance the ability of bacteria to extract the**
(a) Copper (b) Uranium (c) Gold (d) All of them

30. **The technique developed to introduce foreign genes into immature plant embryo is called**
(a) Transgenic (b) Genetic engineering
(c) Cloning (d) Genetic recombination

31. **The enzyme RuBP helps in the capturing of**
(a) CO_2 (b) O_2 (c) Hydrogen (d) All of them

32. **Plants are being engineered to produce**
(a) Human hormone (b) Clotting factors (c) Antibodies (d) All of them

33. **The technique developed to insert genes into the eggs of animals is called**
(a) Transgenic animals (b) Transgenic plants (c) Cloning (d) None of them

34. **______ is used for preventing blood clot during surgery.**
(a) Haemoglobin (b) Antithrombin (c) Fibrinogen (d) All of them

35. **Cloning is a form of ______ reproduction**
(a) Asexual (b) Sexual (c) Hermaphrodites (d) None of them

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36. ___cells are those that cling to an egg after evolution occurs.
(a) Cumulus cells (b) Embryonic cells (c) Both a and b (d) None of them

37. ______is the insertion of genetic material into human cells for the treatment of disorder.
(a) Genetic engineering (b) Gene therapy
(c) Cloning (d) Genetic recombination

38. A condition develops when liver cells lack a receptor for removing cholesterol from the blood is called
(a) Gene therapy (b) Hypercholesterolemia
(c) Immuno deficiency syndrome (d) None of them

39. To cure Parkinson's disease, dopamine-producing cells could be grafted directly into the
(a) Arms (b) Shoulders (c) Brain (d) None of them

40. Who did say in 1902 that plant cells are totiportant?
(a) Gottlieb (b) Hyberlent (c) Shewan (d) All of them

41. Transgenic plant carries out foreign ______ that have been introduced into their cells.
(a) Genes (b) Allele (c) Cells (d) All of them

42. A ______ can be used to produce recombinant DNA.
(a) Virus (b) Bacteria (c) Plasmid (d) Plant cell

43. ________ is used to produce crops that have improved agriculture or food quality traits.
(a) Cloning (b) Transgenesis (c) Gentic engineering (d) None of them

44. ______is the example of salt tolerant plant.
(a) Cassia Fistula (b) Solanum Nigram (c) Arabidopsis (d) None of them

45. Soya bean produces the monounsaturated fatty acid i.e.
(a) Oleic acid (b) Vernolic acid (c) Ricinoleic acid (d) All of them

ANSWERS

1.	d	2.	c	3.	a	4.	a	5.	b	6.	a	7.	b
8.	c	9.	c	10.	c	11.	c	12.	a	13.	b	14.	b
15.	b	16.	a	17.	b	18.	b	19.	c	20.	b	21.	b
22.	a	23.	c	24.	b	25.	a	26.	d	27.	a	28.	a
29.	d	30.	a	31.	a	32.	d	33.	a	34.	b	35.	a
36.	a	37.	b	38.	b	39.	c	40.	c	41.	a	42.	c
43.	c	44.	c	45.	d								

EVOLUTION

1. **The process that has transformed life on earth from its earliest forms to the vast diversity is called**
   (a) Reproduction (b) Evolution (c) Succession (d) All of them
2. **Creationists believe in one of the following theories.**
   (a) Theory of special creation (b) Theory of natural selection
   (c) Theory of evolution (d) All of them
3. **Evolutionists believe in one of the following theories**
   (a) Theory of special creation (b) Theory of natural selection
   (c) Theory of evolution (d) Both b and c
4. **Who believed in theory of evolution?**
   (a) Linnaeus (b) Lamarck (c) Darwin (d) Wallace
5. **Who introduced binomial nomenclature for naming species?**
   (a) Lamarck (b) Linnaeus (c) Darwin (d) Lyell
6. **The underwater hot springs are called**
   (a) Hydrothermal events (b) Hydroelectrical springs
   (c) Hydrothermal springs (d) None of them
7. **A group of bacteria that can tolerate temperatures upto 120°C is called**
   (a) Zoobacteria (b) Azotobacter (c) Archeobacteria (d) All of them
8. **The first photosynthetic organism used following compound as a source of hydrogen**
   (a) Hydrogen sulphide (b) Sulphuric acid
   (c) Water (d) Hydrogen peroxide
9. **The endosymbiont hypothesis was proposed by**
   (a) Lynn Margulis (b) Malthus (c) Linnaeus (d) Aristotle
10. **The hypothesis that aerobic bacteria developed into mitochondria is called**
    (a) Mitochondria hypothesis (b) Endosymbiont hypothesis
    (c) Darwin's hypothesis (d) None of them
11. **Who published essay on the "principle of population"**
    (a) Malthus (b) Aristotle (c) Darwin (d) Wallace
12. **Who explained earth history by catastrophism?**
    (a) Lyell (b) Lynn Margulis (c) Cuvier (d) Lamarck
13. **The prokaryotes may have arisen ______ billion years ago.**
    (a) 3.5 (b) 7.5 (c) 8.5 (d) 10
14. **Lamarck published his theory of evolution in**
    (a) 1800 A.D. (b) 1809 A.D. (c) 1900 B.C. (d) 1800 B.C.
15. **"The modifications that an organism acquires, can be passed along to its offspring's". This idea was given by**
    (a) Darwin (b) Lamarck (c) Lyell (d) Lynn Margulis

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16. **Charles Darwin was born in ______ (city).**
(a) London (b) Jersy (c) Shrewsbury (d) None of them

17. **Charles Darwin was born in ______ A.D.**
(a) 1809 (b) 1831 (c) 1909 (d) 1709

18. **The term Galapagos refers to**
(a) A city (b) An island (c) An animal (d) None of them

19. **The Wallace's papers about the theory of natural selection were presented to ______ Society of London.**
(a) Lamarkian (b) Darwinian (c) Linnaean (d) Evolutionary

20. **Darwin's theory "The origin of species" was published in ______ A.D.**
(a) 1859 (b) 1809 (c) 1840 (d) 1858

21. **Alfred Wallace was working in**
(a) East Indies (b) East India (c) West India (d) West Indies

22. **One of the following statements about Darwin in not true.**
(a) He believed in Descent with modification (b) He believed in Natural selection
(c) He was naturalist (d) He was evolutionist

23. **One of the following statements is not the part of Darwin's theory of natural selection.**
(a) Production of more individuals than the environment can support, leads to a struggle for existence among individuals of a population.
(b) Survival in the struggle for existence is not random but it depends upon one's inherited structure.
(c) Unequal ability of individuals to survive and reproduce will lead to a gradual change in a population.
(d) There is a inheritance of all acquired characteristics.

24. **The Neo– Darwinism is also called**
(a) Modern evolutionary synthesis (b) Origin of species
(c) Perceived unity in life (d) All of them

25. **The origin of species convinced most biologists that species are products of**
(a) Reproduction (b) Nature (c) Evolution (d) All of them

26. **The comprehensive theory of evolution is now known as**
(a) Origin of species (b) Modern theory of origin of species
(c) Theory of natural selection (d) Modern synthesis

27. **The modern synthesis is called synthesis because**
(a) It integrated discoveries and ideas from many fields
(b) It was developed by different scientists.
(c) It was written by many scientists
(d) None of them

28. **Darwin's theory of evolution was mainly based on**
(a) Evidences from biogeography
(b) Evidences from vestigial organs
(c) Evidences from comparative anatomy
(d) All of them

29. Which one of the following evidences does not support theory of evolution?
(a) Succession of fossil forms
(b) Anatomical similarities between species grouped in the same taxonomic category
(c) Closely related organisms go through similar stages in their embryonic development
(d) None of them

30. The historical remnants of structures that had important functions in ancestors are called
(a) Useful organs (b) Wasteful organs (c) Vestigial organs (d) Vestigial organs

31. One of the following organs is not vestigial.
(a) Nictating membrane in mammals (b) Ear muscles in man
(c) Appendix in herbivores (d) None of them

32. Flower parts are considered to have evolved from
(a) Flower (b) Leaves (c) Stem (d) Root

33. Darwin believed in perceived unity in life which means
(a) All organisms have common ancestors (b) All types of lives are same
(c) Life is like a unit (d) None of them

34. ______ are the earliest vertebrates according to fossil record.
(a) Mammals (b) Birds (c) Reptiles (d) Fishes

35. Similarity in characteristics resulting from common ancestry is known as
(a) Heteorology (b) Biology (c) Chronology (d) Homology

36. "The evolution is a remodeling process in which ancestral structures that functioned in one capacity become modified as they take on new function." This statement can be explained by considering one of the following evidences
(a) Evidence from molecular biology (b) Evidence from comparative embryology
(c) Evidence from comparative anatomy (d) Evidence trom biogeography

37. Eustachian tubes that connect the middle ear with the throat in humans have been thought to evolve from
(a) Vertebral column (b) Brainstem (c) Gill pouches (d) None of them

38. Cytochrome C, a respiratory protein, is found in
(a) All humans (b) All animals
(c) All anaerobic organisms (d) All aerobic species

39. A group of interbreeding individuals belonging to a particular species and sharing a common geographical area is called
(a) Population (b) Community (c) Niche (d) None of them

40. The total aggregate of genes in a population at any one time is called
(a) Genome (b) Gene pool (c) Gene pond (d) None of them

41. One of the following statements is not true about evolution.
(a) Evolution is compatible with mechanism of inheritance
(b) Evolution brings diversity in organisms
(c) Evolution is a continuous process
(d) None of them

42. A group of population that has the potential to interbreed in nature is called
(a) Species (b) Community (c) Ecological Niche (d) None of them

43. **All the alleles at all gene loci in all individuals of the population is called**
(a) Genome (b) Gene pool (c) Gene pond (d) None of them

44. **For a diploid species, each locus is represented ______ in the genome of an individual.**
(a) Thrice (b) Twice (c) Once (d) None of them

45. **If all the members of population are homozygous for the same allele, that allele is said to be**
(a) Fixed (b) Changed (c) Mutated (d) None of them

46. **Hardy – Weinberg theorem was stated by**
(a) Only Hardy (b) Only Weinberg
(c) Both Hardy and Weinberg (d) None of them

47. **Hardy – Weinberg Theorem was stated in**
(a) 1809 A.D. (b) 1908 A.D. (c) 1900 A.D. (d) None of them

48. **The statement, "The genetic structure of a non-evolving population remains constant over the generations" is termed as**
(a) Hardy Theorem (b) Hardy – Weinberg Theorem
(c) Genetic recombination Theorem (d) None of them

49. **One of the following statements does not match with Hardy – Weinberg theorem.**
(a) The genetic structure of a non – evolving population remains constant over the generations.
(b) Meiosis has no effect on the overall genetic structure of population
(c) The total population's gene pool does not remain constant over the generations
(d) All of them

50. **Which one of the following formulae is called Hardy – Weinberg equation?**
(a) $p+q=1$ (b) $p-q=1$ (c) $p+q=0$ (d) None of them

51. **Which one of the following formulae cannot be derived from Hardy – Weinberg equation?**
(a) $p+q=1$ (b) $1-q=q$ (c) $1+q=p$ (d) None of them

52. **Total number of alleles of a particular trait present in gene pool is called**
(a) Genotypic frequency (b) Allelic frequency
(c) Phenotypic frequency (d) None of them

53. **The total genotypes for a particular trait in a gene pool is called**
(a) Allelic frequency (b) Genotypic frequency
(c) Phenotypic frequency (d) All of them

54. **According to Hardy – Weinberg's theorem,**
(a) Allelic frequency cannot remain constant in a gene pool
(b) Genotypic frequency cannot remain constant in a gene pool
(c) Allelic frequency and genotypic frequency always remain constant in a gene pool
(d) None of them

55. **One of them following factors cannot alter gene frequency.**
(a) Sexual recombination (b) Mutation
(c) Genetic drift (d) Non-random mating

56. **One of the following factors can change gene frequency.**
(a) Sexual recombination (b) Random mating
(c) Mutation (d) None of them

57. Genetic drift can change
(a) Allelic frequency
(b) Gene frequency
(c) Genotypic frequency
(d) All of them

58. Condition for Hardy – Weinberg theorem is
(a) Gene pool should not be acted upon by agents other than sexual recombination
(b) Mutations should take place in gene pool
(c) Sexual recombination should not take place
(d) All of them

59. One of the following factors cannot cause change in gene pool.
(a) Mutation (b) Migration (c) Meiosis (d) Genetic drift

60. The change in frequency of alleles at a locus that occurs by chance is called
(a) Mutation
(b) Selection
(c) Non – random mating
(d) Genetic drift

61. Archeobacteria can tolerate high temperatures upto
(a) 120°C (b) 150°C (c) 200°C (d) 500°C

62. The first eukaryotes appeared about _____ years ago.
(a) 3.5 billion years ago
(b) 2 billion years ago
(c) 1.5 billion years ago
(d) None of them

63. Who presented a theory of natural selection essentially identical to Darwin?
(a) Malthus (b) Wallace (c) Cuvier (d) Lamarck

64. _______ are considered to be the ancestors of all lives.
(a) Eukaryotes (b) Prokaryotes (c) Mammals (d) Birds

65. A respiratory protein called _______ is found in all aerobic organisms.
(a) Cytochrome A (b) Actin (c) Myocin (d) Cytochrame C

66. Hardy – Weinberg's theory describes a _____ population.
(a) Evolving population
(b) Population living in a particular area
(c) Non – evolving population
(d) None of them

67. _______ is a series of changes in the genetic composition of a population over time.
(a) Evolution (b) Reproduction (c) Respiration (d) None of them

68. Hardy Weinberg's theorem is binomial expansion of
(a) $(a + b + c)^2$ (b) $(a - b)^2$ (c) $(a + b)^2$ (d) None of them

69. A species who is in imminent danger of extinction throughout its range is called
(a) Evolving species
(b) Non-evolving species
(c) Endangered species
(d) None of them

70. Who published an essay an "The principle of population"?
(a) Malthus (b) Cuvier (c) Lyell (d) Lynn Margulis

71. The gill pouches of mammals and bird embryos are
(a) Support for "ontogeny recapitulates phylogeny"
(b) Homologous structures
(c) Used by the embryos to breathe
(d) Evidence for the degeneration of unused body parts

72. The smallest biological unit that can evolve over time is
(a) A particular cell
(b) An individual organism
(c) A population
(d) None of them

73. Selection acts directly on
(a) Phenotype
(b) Genotype
(c) Genome of a particular organism
(d) The entire gene pool

74. Level of classification between species and family is called
(a) Phylum (b) Genus (c) Class (d) Order

75. Habitats other than _____ are being seriously threatened.
(a) Grassland (b) Desert (c) Rain forest (d) None of them

76. Endangered species have been recorded to more than
(a) 500 (b) 700 (c) 1000 (d) 1500

77. In Ecuador, forest coverage has been reduced to
(a) 44% (b) 95% (c) 50% (d) None of them

78. One of the following factors is not the cause of extinction of species
(a) Climate change
(b) Pollution
(c) Invasions from foreign species
(d) Growing of botanical gardens

79. Endangered species have been resulted due to
(a) Protection of landscapes
(b) Formation of zoos
(c) Formation of botanical gardens
(d) Destruction of habitats

80. Darwin's theory, as presented in the origin of species, is mainly concerned with
(a) How new species arise
(b) How adaptations evolve
(c) How extinctions occur
(d) The genetics of evolutions

ANSWERS

1.	b	2.	a	3.	d	4.	b	5.	b	6.	a	7.	c
8.	a	9.	a	10.	b	11.	a	12.	c	13.	a	14.	b
15.	b	16.	c	17.	a	18.	b	19.	c	20.	a	21.	a
22.	c	23.	d	24.	a	25.	c	26.	d	27.	a	28.	a
29.	d	30.	c	31.	c	32.	b	33.	a	34.	d	35.	d
36.	c	37.	c	38.	d	39.	a	40.	b	41.	d	42.	a
43.	a	44.	b	45.	a	46.	c	47.	a	48.	b	49.	c
50.	a	51.	d	52.	b	53.	b	54.	c	55.	a	56.	c
57.	d	58.	a	59.	c	60.	d	61.	a	62.	c	63.	b
64.	b	65.	d	66.	c	67.	a	68.	c	69.	c	70.	a
71.	b	72.	c	73.	d	74.	b	75.	c	76.	a	77.	b
78.	d	79.	d	80.	b								

CHEMISTRY

ATOMIC STRUCTURE

SET – I

1. **Nucleons comprise ________.**
   (a) Neutrons and electrons (b) Neutrons and the protons
   (c) Only electrons (d) Only protons
2. **The size of the nucleus is about ________ times smaller than atom.**
   (a) 1200 (b) 1500 (c) 5000 (d) 10000
3. **The number of electrons balances out the number of protons. This statement shows that ___.**
   (a) All atoms have positive charge (b) All atoms have zero charge
   (c) Most atoms are neutral (d) None of these
4. **An ion gains ________ charge when electrons are removed and gains negative charge when electrons are added.**
   (a) Neutral (b) Positive (c) Negative (d) None of these
5. **In an atom, the number of protons remains ________, but the number of neutrons is different.**
   (a) Same (b) Equal (c) Positive (d) Negative
6. **Rutherford's Alpha Scattering Experiment shows that the nucleus is very small and____.**
   (a) Same charged (b) No charged (c) Negative charged (d) Positively charged
7. **The most convincing indication in the Alpha Scattering Experiment is a tiny proportion of alpha particles appear to be reflected**
   (a) Straight. (b) Right back. (c) Left back. (d) None of these
8. **The nucleus is unstable hence some isotopes are ________**
   (a) Similar (b) Same structure (c) Radioactive (d) None of these
9. **Atomic number of an isotope of cadmium is 48 and a mass number is 112. This shows that this isotope has**
   (a) 48 protons, 112 neutrons and 48 electrons (b) 48 protons, 10 neutrons and 18 electrons
   (c) 48 protons, 12 neutrons and 28 electrons (d) 48 protons, 11 neutrons and 38 electrons

ANSWERS

1.	b	2.	d	3.	c	4.	b	5.	a	6.	d	7.	b
8.	c	9.	a										

SET – II

1. **Electron was discovered by**
   (a) J.J Thomson (b) Goldstein (c) Chadwick (d) None of them
2. **Cathode rays were produced in discharged tube at**
   (a) High pressure (b) Low pressure (c) Ordinary pressure (d) All pressures

3. **Cathode rays were produced in discharged tube at**
   (a) High voltage (b) Low voltage (c) Ordinary voltage (d) All voltages
4. **Which scientist established electric charge on electrons?**
   (a) J. Perrin (b) J.J. Thomson (c) Both a and b (d) None of them
5. **Cathode rays produced _______ fluorescence on striking the walls of glass tube.**
   (a) Blackish (b) Bluish (c) Greenish (d) Brownish
6. **When alumina placed in path of cathode rays, alumina glows**
   (a) Black (b) Blue (c) Green (d) Red
7. **When tin stone placed in path of cathode rays, tin glows**
   (a) Yellow (b) Blue (c) Green (d) Red
8. **Cathode rays travel in discharge tube**
   (a) Perpendicular to surface of cathode (b) Perpendicular to surface of anode
   (c) Horizontal to surface of cathode (d) Horizontal to surface of anode
9. **In cathode rays, e/m values**
   (a) Depend upon nature of gas (b) Do not depend upon nature of gas
   (c) Depend upon amount of air (d) None of them
10. **In anode rays, e/m values**
   (a) Depend upon nature of gas (b) Do not depend upon nature of gas
   (c) Depend upon amount of air (d) None of them
11. **Cathode rays can produce X-rays when they strike on anode particularly with**
   (a) Large atomic mass (b) Small atomic mass (c) Both a and b (d) None of them
12. **Which type of cathode is used to focus cathode rays on a platinum foil?**
   (a) Convex cathode (b) Concave cathode (c) Both a and b (d) None of them
13. **Cathode rays have _______ effect.**
   (a) Oxidizing (b) Reducing (c) Hydrolysing (d) Catalysing
14. **Which scientis named cathode rays as electrons?**
   (a) J.J. Thomson (b) J Perrin (c) Stonely (d) None of them
15. **Proton was discovered by**
   (a) J.J. Thomson (b) Goldstein (c) Chadwick (d) J Perrin
16. **Positive rays produce flashes on**
   (a) Aluminium plate (b) Zinc plate
   (c) Platinum plate (d) Zinc sulphide plate
17. **Which of the following statements is correct?**
   (a) e/m for positive ray is larger than e/m for negative ray
   (b) e/m for positive ray is smaller than e/m for negative ray
   (c) e/m for positive ray is equal to e/m for negative ray
   (d) None of them
18. **Which scientist named anode rays as proton?**
   (a) Stonely (b) J. Perrin (c) Thomson (d) Rutherford

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19. **The mass of proton is_______ times more than that of an electron.**
(a) 1636 (b) 1736 (c) 1836 (d) 1936

20. **Neutron was discovered by**
(a) J.J. Thomson (b) Goldstein (c) Chadwick (d) None of them

21. **Which scientist was awarded noble prize in physics?**
(a) J.J. Thomson (b) Goldstein (c) Chadwick (d) None of them

22. **A stream of alpha particles produced form polonium source was detected at**
(a) Barium target (b) Beryllium target (c) Polonium target (d) Zinc target

23. **${}^{4}_{2}He + {}^{9}_{4}Be \rightarrow ? + {}^{1}_{0}n$**
(a) ${}^{12}_{6}C$ (b) ${}^{13}_{6}C$ (c) ${}^{9}_{5}B$ (d) ${}^{10}_{5}B$

24. **Free neutron decays into**
(a) Proton, electron and deuteron (b) Proton, electron and deuterium
(c) Proton, electron and protrium (d) Proton, electron and neutrino

25. **${}^{1}_{0}n \rightarrow {}^{1}_{1}P + {}^{0}_{1}e + ?$**
(a) ${}^{3}_{0}n$ (b) ${}^{2}_{0}n$ (c) ${}^{1}_{0}n$ (d) ${}^{0}_{0}n$

26. **Neutrons are _______ penetrating particles.**
(a) High (b) Low (c) Intermediate (d) None of them

27. **Fast neutrons travel with an energy**
(a) 1.2 Mev (b) 1.4 Mev (c) 1.6 Mev (d) 1.8 Mev

28. **Slow neutrons travel with an energy**
(a) Above 1 Mev (b) Below 1 Mev (c) Above 1 ev (d) Below 1 ev

29. **Slow neutrons are _______ effective than fast neutron for fission purposes.**
(a) Less (b) More (c) Same (d) Differentially

30. **${}^{14}_{7}N + {}^{1}_{0}n \rightarrow {}^{11}_{5}B + ?$**
(a) ${}^{1}_{1}H$ (b) ${}^{4}_{2}He$ (c) ${}^{12}_{6}C$ (d) None of them

31. **${}^{65}_{29}Cu + {}^{1}_{0}n \rightarrow {}^{66}_{29}Cu + ?$**
(a) ${}^{1}_{1}H$ (b) ${}^{4}_{2}He$ (c) ${}^{12}_{6}C$ (d) hv

32. **${}^{66}_{29}Cu \rightarrow ? + {}^{0}_{-1}e$**
(a) ${}^{65}_{30}Zn$ (b) ${}^{66}_{30}Zn$ (c) ${}^{67}_{30}Zn$ (d) ${}^{68}_{30}Zn$

33. **An instrument was devised to measure the e/m value of electrons by**
(a) J.J. Thomson (b) J. Perrin (c) Goldstein (d) Chadwick

34. **Which radiations are emitted, when slow moving neutrons hit the copper metal?**
(a) Alpha (b) Beta (c) Gamma (d) Delta

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35. e/m value for electron is
(a) 1.7588×10^{10} C/Kg
(b) 1.7588×10^{-10} C/Kg
(c) 1.7588×10^{11} C/Kg
(d) 1.7588×10^{-11} C/Kg

36. Which scientist determined the charge on electron?
(a) Stonely (b) Rutherford (c) Millikan (d) None of them

37. Mathematical expression for Millikan's oil drop method is:
(a) $\frac{V_1}{V_2} = \frac{mg}{He - mg}$ (b) $\frac{V_1}{V_2} = \frac{He - mg}{mg}$ (c) $\frac{V_2}{V_1} = \frac{mg}{He - mg}$ (d) None of them

38. Charge on proton in coulomb is
(a) $+1.6022 \times 10^{-18}$ (b) $+1.6022 \times 10^{-19}$ (c) $+1.6022 \times 10^{-20}$ (d) $+1.6022 \times 10^{-21}$

39. Charge on electron in coulomb is
(a) -1.6022×10^{-18} (b) -1.6022×10^{-19} (c) -1.6022×10^{-20} (d) -1.6022×10^{-21}

40. Mass of proton in kg is
(a) 1.6726×10^{-27} (b) 1.6750×10^{-27} (c) 9.1095×10^{-31} (d) None of them

41. Mathematical value of $\varepsilon h^2 / \pi m e^2$ is equal to
(a) 0.529×10^{-10} m (b) 0.529×10^{-1} nm (c) 0.529 A° (d) All of them

42. If electron moves through a small distance (dr), then the work done for moving electron is given by
(a) $\frac{Ze}{4\pi\varepsilon_o r} dr$ (b) $\frac{4\pi\varepsilon_o r}{Ze} dr$ (c) $\frac{Ze^2}{4\pi\varepsilon_o r^2} dr$ (d) $\frac{4\pi\varepsilon_o r^2}{Ze^2} dr$

43. Mathematical value for $m^2 e^4 / 8\varepsilon_o^2 h^2$ is______.
(a) 2.178×10^{-16} J (b) 2.178×10^{-17} J (c) 2.178×10^{-18} J (d) 2.178×10^{-19} J

44. Spectrum contains bright background against dark lines is called
(a) Atomic emission spectrum
(b) Atomic absorption spectrum
(c) Both a and b
(d) None of them

45. Lyman series is found in
(a) Ultraviolet region (b) Infrared region (c) Visible region (d) None of them

46. Balmer series is found in
(a) Ultraviolet region (b) Infrared region (c) Visible region (d) None of them

47. Paschen series is found in
(a) Ultraviolet region (b) Infrared region (c) Visible region (d) None of them

48. Brackett series is found in
(a) Ultraviolet region (b) Infrared region (c) Visible region (d) None of them

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49. Pfund series is found in
(a) Ultraviolet region (b) Infrared region (c) Visible region (d) None of them

50. From Lyman to Pfund series, the wave numbers of spectral lines
(a) Increase (b) Decrease (c) Remain constant (d) None of them

51. Wave equation for hydrogen atom is set up by
(a) Schrodinger (b) Heisenberg (c) Dirac (d) All of them

52. The volume of space in which there is ______ chance of finding an electron is called atomic orbital
(a) 90 % (b) 95 % (c) 98 % (d) 100 %

53. The sets of numerical values which give acceptable solutions for electron of any atom is called
(a) Principal quantum no. (b) Azimuthal quantum no.
(c) Magnetic quantum no. (d) Quantum no.

54. Quantum number which represents shell or energy level in which electron revolves around nucleus is called
(a) Principal quantum no. (b) Azimuthal quantum no.
(c) Magnetic quantum no. (d) Spin quantum no.

55. Quantum number which represents shape of orbital of electron is called
(a) Principal quantum no. (b) Azimuthal quantum no.
(c) Magnetic quantum no. (d) Spin quantum no.

56. Quantum number which represents orientation of orbital in magnetic field is called
(a) Principal quantum no. (b) Azimuthal quantum no.
(c) Magnetic quantum no. (d) Spin quantum no.

57. Quantum number which represents clockwise or anticlockwise rotation of electron in an orbital is called
(a) Principal quantum no. (b) Azimuthal quantum no.
(c) Magnetic quantum no. (d) Spin quantum no.

58. Mathematical values for principal quantum number
(a) Natural numbers (b) Whole numbers (c) Integers (d) None of them

59. Mathematical values for azimuthal quantum number are
(a) Natural numbers (b) Whole numbers (c) Integers (d) None of them

60. Mathematical formula for azimuthal quantum number is
(a) $\ell = n + 1$ (b) $\ell = n - 1$ (c) $\ell = 2n + 1$ (d) $\ell = 2n - 1$

61. For s–sub shell
(a) $\ell = 0, m = 0$ (b) $\ell = 1, m = 0, \pm 1$
(c) $\ell = 2, m = 0, \pm 1, \pm 2$ (d) $\ell = 3, m = 0 \pm 1, \pm 2, \pm 3$

62. For p– sub shell
(a) $\ell = 0, m = 0$ (b) $\ell = 1, m = 0, \pm 1$

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(c) $\ell = 2$, m = 0, ±1, ±2 (d) $\ell = 3$, m = 0 ±1, ±2, ±3

63. **For d-sub shell**
 (a) $\ell = 0$, m = 0 (b) $\ell = 1$, m = 0, ±1
 (c) $\ell = 2$, m = 0, ±1, ±2 (d) $\ell = 3$, m = 0 ±1, ±2, ±3

64. **For f-sub shell**
 (a) $\ell = 0$, m = 0 (b) $\ell = 1$, m = 0, ±1
 (c) $\ell = 2$, m = 0, ±1, ±2 (d) $\ell = 3$, m = 0 ±1, ±2, ±3

65. **What is the shape of s-sub shell?**
 (a) Spherical (b) Dumb-bell (c) Complicated (d) More complicated

66. **Rutherford's atomic model failed because**
 (a) The atom did not have nucleus and electrons
 (b) It did not account for attraction between protons and neutrons
 (c) It did not account for stability of atom
 (d) There is actually no space between nucleus and electrons

67. **Bohr's model of atom is contradicted by**
 (a) Plank's quantum theory (b) Pauli's exclusion principle
 (c) Heisenberg's uncertainty principle (d) All of them

68. **Quantum number values for 2p orbitals are**
 (a) n = 2, $\ell = 1$ (b) n = 1, $\ell = 2$ (c) n = 1, $\ell = 0$ (d) n = 2, $\ell = 0$

69. **In ground state of atom, the electron is present**
 (a) In the nucleus (b) In the second shell
 (c) Nearest to nucleus (d) Farthest from the nucleus

70. **When 6d orbital is complete, the entering electron goes to**
 (a) 7f (b) 7s (c) 7p (d) 7d

ANSWERS

1.	a	2.	b	3.	a	4.	b	5.	c	6.	a	7.	a
8.	a	9.	b	10.	a	11.	a	12.	b	13.	b	14.	c
15.	b	16.	d	17.	b	18.	d	19.	c	20.	c	21.	c
22.	b	23.	a	24.	d	25.	d	26.	a	27.	a	28.	d
29.	b	30.	b	31.	d	32.	b	33.	a	34.	c	35.	c
36.	c	37.	a	38.	b	39.	b	40.	a	41.	d	42.	c
43.	c	44.	b	45.	a	46.	c	47.	b	48.	b	49.	b
50.	b	51.	a	52.	b	53.	d	54.	a	55.	b	56.	c
57.	d	58.	a	59.	b	60.	b	61.	a	62.	b	63.	c
64.	d	65.	a	66.	c	67.	c	68.	a	69.	c	70.	c

AWARENESS OF LIQUIDS AND SOLIDS

1. **Intermolecular forces**
   (a) Concern with valence electrons (b) Do not concern with valence electrons
   (c) Concern with phase changes (d) Both c and d
2. **How many types of intermolecular forces are there?**
   (a) 2 (b) 3 (c) 4 (d) 5
3. **What is the percentage effectiveness of dipole-dipole forces?**
   (a) 1% (b) 2% (c) 3% (d) None of them
4. **The strength of intermolecular forces depends upon**
   (a) Electronegativity difference between bonded atoms
   (b) Distance between molecules
   (c) Size of atoms, ions and molecules (d) Both a and b
5. **Greater the strength of dipole–dipole forces**
   (a) Greater are the values of thermodynamic parameters
   (b) Smaller are the values of thermodynamic parameters
   (c) Both a and b (d) None of them
6. **Intermolecular forces between chloroform molecules is the example of**
   (a) Dipole–dipole forces (b) Ion–dipole forces
   (c) Dipole–induced dipole forces (d) Instantaneous dipole–induced dipole forces
7. **The dissolution of most of ionic compounds in water is due to**
   (a) Hydrogen bonding (b) Dipole forces (c) Hydration (d) None of them
8. **The forces of attraction between ions and water molecules are known as**
   (a) Dipole–dipole forces (b) Ion–dipole forces
   (c) Dipole–induced dipole forces (d) Instantaneous dipole–induced dipole forces
9. **Dipole–induced dipole forces are present between**
   (a) Polar and polar molecules (b) Non– polar and non–polar molecules
   (c) Polar and non–polar molecules (d) None of them
10. **Dipole–induced dipole forces are also called**
    (a) London forces (b) Fritz forces (c) Debye forces (d) None of them
11. **Instantaneous dipole–induced dipole forces are also called**
    (a) London forces (b) Fritz forces (c) Debye forces (d) Both A and B
12. **London dispersion forces are significantly**
    (a) Strong attractive forces between polar molecules
    (b) Strong attractive forces between non–polar molecules
    (c) Weak attractive forces between polar molecules
    (d) Weak attractive forces between non–polar molecules

13. **London forces are ______ than dipole–dipole interactions.**
(a) Stronger (b) Weaker
(c) Neither weaker nor stronger (d) Both a and b

14. **The boiling points of group zero elements ______ in the group from top to bottom**
(a) Increase (b) Decrease
(c) Neither increase nor decrease (d) Both a and b

15. **The atomic number of any element ______ in the group from top to bottom.**
(a) Increase (b) Decreases (c) Both a and b (d) None of them

16. **The polarizability of group zero ______ in the group from top to bottom.**
(a) Increases (b) Decreases (c) Both a and b (d) None of them

17. **Quantitative measurement of the extent to which the electronic cloud can be distorted is called**
(a) Polarizability (b) Re–polarizability (c) De–polarizability (d) None of them

18. **All the halogens are**
(a) Polar monoatomic molecules (b) Non–polar monoatomic molecules
(c) Non–polar diatomic molecules (d) Polar diatomic molecules

19. **Boiling point of fluorine molecule is**
(a) 185° C (b) 186° C (c) 187° C (d) 188° C

20. **Boiling point of iodine molecule is**
(a) 181° C (b) 182° C (c) 183° C (d) 184° C

21. **Boiling point of Helium atom is**
(a) 268.6° C (b) 267.6° C (c) 266.6° C (d) 265.6° C

22. **Boiling point of Radon atom is**
(a) 61.8° C (b) 62.8° C (c) 63.8° C (d) 64.8° C

23. **In which state of matter, fluorine exists at room temperature?**
(a) Solid (b) Liquid (c) Gas (d) Plasma

24. **In which state of matter, iodine exists at room temperature?**
(a) Solid (b) Liquid (c) Gas (d) Plasma

25. **The polarizability of iodine molecule is much ____ than that of fluorine.**
(a) Lesser (b) Greater (c) Both a and b (d) None of them

26. **Which of the following statements is correct**
(a) Greater the no. of atoms in molecule, greater is its polarizability
(b) Lesser the no. of atoms in molecule, lesser is its polarizability
(c) Greater the no. of atoms in molecule, lesser is its polarizability
(d) Lesser the no. of atoms in molecule, greater is its polarizability

27. **The factors affecting the London forces are**
(a) Size of electronic cloud, polarizability, melting point
(b) Size of electronic cloud, depolarizability, boiling point
(c) Size of electronic cloud, polarizability, no. of atoms in molecule
(d) None of them

28. Water is ______ molecule.
(a) Polar (b) Non-polar (c) Both a and b (d) None of them

29. What type of force is present among water molecules?
(a) Hydrogen bonding (b) Dipole–dipole forces
(c) London forces (d) Both a and b

30. How many lone pairs are there in oxygen atom?
(a) 2 (b) 3 (c) 4 (d) 5

31. What is the most electronegative element in the periodic table?
(a) Fluorine (b) Chlorine (c) Bromine (d) Iodine

32. How many times the strength of hydrogen bond is less than that of covalent bond?
(a) Ten times (b) Twenty times (c) Thirty times (d) Forty times

33. The boiling point of hydrides of IV–A group is ______ as compared to V–A, VI–A and VII–A groups:
(a) Low (b) High (c) Intermediate (d) None of them

34. Which compound has lowest boiling point?
(a) Methane (b) Ethane (c) Propane (d) Butane

35. Electronegative character of elements ______ in the periods from left to right.
(a) Decreases (b) Increases (c) Both a and b (d) None of them

36. Water is liquid at room temperature due to
(a) Increasing electronegative character of H_2O from left to right.
(b) Decreasing electronegative character of H_2O from left to right
(c) Both a and b (d) None of them

37. Fluorine is ______ electronegative than oxygen.
(a) Less (b) More (c) Both a and b (d) None of them

38. Which of the following statements is correct?
(a) H–bonding in HF is stronger than in H_2O (b) H–bonding in HF is weaker than in H_2O
(c) Both a and b (d) None of them

39. Boiling point of compound is increased by increasing
(a) Electronegative character (b) Polarizability
(c) Both a and b (d) None of them

40. The boiling point of HCl is slightly ______ than that of HBr
(a) Higher (b) Lower (c) Both a and b (d) None of them

41. What is the best example of H–bonded system?
(a) HF (b) HCl (c) NH_3 (d) H_2O

42. Which of the following statements is correct?
(a) Hydrocarbons are soluble in water (b) Hydrocarbons are not soluble in water
(c) Hydrocarbons are readily soluble in water (d) None of them

43. Which part of molecules of soaps and detergents is water soluble?
(a) Polar part (b) Non-polar part (c) Both a and b (d) None of them

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44. **Which part of molecules of soaps and detergents is water insoluble?**
(a) Polar part (b) Non-polar part (c) Both a and b (d) None of them

45. **Which groups are vertically adjacent to one another in right handed helix?**
(a) >NH and >C=0 (b) >NH_2 and >C=0
(c) >NH and >CH=0 (d) >NH_2 and >CH=0

46. **On the average, there are _______ amino acid units for each turn of helix.**
(a) 25 (b) 26 (c) 27 (d) 28

47. **How many spiral chains of amino acids in DNA?**
(a) 2 (b) 3 (c) 4 (d) 5

48. **What is the diameter of double helix in DNA?**
(a) 18 – 20 A (b) 16 – 18 A (c) 14 – 16 A (d) 12 – 14 A

49. **Hydrogen bonding is found in**
(a) H_2O and HF (b) Paints and dyes (c) Glue and honey (d) All of them

50. **Hydrogen bonding in clothing is responsible for**
(a) Durability (b) Rigidity (c) Tensile strength (d) All of them

51. **Which group is responsible for hydrogen bonding in food materials?**
(a) CH=0 (b) $-NH_2$ (c) –OH (d) All of them

52. **How many empty spaces are occupied by H_2O molecules in the ice structure to decrease density?**
(a) 8 % (b) 9 % (c) 10 % (d) 11 %

53. **Water freezes from surface to downward direction due to:**
(a) Lower density of ice than liquid water at 0° C.
(b) Higher density of ice than liquid water at 0° C.
(c) Lower density of liquid water than ice at 0° C.
(d) None of them

54. **At 4°C, the water has _______ density.**
(a) Maximum (b) Minimum (c) Zero (d) None of them

55. **Below 4°C, the water has _______ density.**
(a) Maximum (b) Minimum (c) Zero (d) None of them

56. **At 4°C, the water has _______ volume.**
(a) Maximum (b) Minimum (c) Zero (d) None of them

57. **Below 4°C, the water has _______ volume.**
(a) Maximum (b) Minimum (c) Zero (d) None of them

58. **Escape of liquid molecules from surface at any temperature is called**
(a) Evaporation (b) Boiling (c) Both a and b (d) None of them

59. **The factors affecting rate of evaporation are**
(a) Surface area, structure of molecule, state of matter
(b) Surface area, temperature, state of matter
(c) Surface area, temperature, intermolecular forces
(d) All of them

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60. **Conversion of vapour into liquid state is called**
(a) Evaporation (b) Vapourization (c) Condensation (d) All of them

61. **In solids, atoms, ions and molecules are held together by**
(a) Adhesive forces (b) Cohesive forces (c) Both a and b (d) None of them

62. **Solid which can shatter is called**
(a) Brittle (b) Malleable (c) Both a and b (d) None of them

63. **Solid which can spread out into thin sheets is called**
(a) Brittle (b) Malleable (c) Both a and b (d) None of them

64. **Glass is the example of**
(a) Brittle (b) Malleable (c) Both a and b (d) None of them

65. **How many types of solid are there?**
(a) 5 (b) 4 (c) 3 (d) 2

66. **Solids in which atoms, ions or molecules are arranged in definite three-dimensional pattern are called**
(a) Crystalline solids (b) Amorphous solids (c) Crystal lattice (d) None of them

67. **The word amorphous means**
(a) Definite (b) Indefinite (c) Shape (d) Shapeless

68. **The crystallites are**
(a) Crystalline part of amorphous solid (b) Crystalline part of crystalline solid
(c) Crystalline part of liquid crystal (d) None of them

69. **The phenomenon in which crystals show variation in physical properties depending upon the direction is called**
(a) Isotropy (b) Anisotropy (c) Isomorphism (d) Polymorphism

70. **Electrons in graphite are mobile for electrical conduction _______ to the layers only.**
(a) Horizontal (b) Vertical (c) Parallel (d) Non-parallel

71. **Crystalline form of NaF is**
(a) Rhombohedral (b) Orthorhombic (c) Cubic (d) None of them

72. **Crystalline form of MgO is**
(a) Rhombohedral (b) Orthorhombic (c) Cubic (d) None of them

73. **The phenomenon in which substance exists in more than one crystalline forms is called**
(a) Isomorphism (b) Polymorphism (c) Allotropy (d) Anisotropy

74. **Polymorphs have same**
(a) Chemical properties (b) Physical properties
(c) Both a and b (d) None of them

75. **Polymorphs have different**
(a) Chemical properties (b) Physical properties
(c) Both a and b (d) None of them

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76. Example of polymorph is
(a) $AgNO_3$ (b) $CaCl_2$ (c) $MgCl_2$ (d) NaF

77. The phenomenon is which an element exists in more than one crystalline forms is called
(a) Isomorphism (b) Polymorphism (c) Allotropy (d) Anisotropy

-78. In rhombohedral crystal system
(a) All angles are 90° (b) All angles are 120°
(c) All angles lie between 90° and 120° (d) None of them

79. In triclinic crystal system
(a) All angles are 90° (b) All angles are not 90°
(c) All angles are 120° (d) None of them

80. How many types of crystalline solids are there?
(a) 2 (b) 3 (c) 4 (d) 5

81. In case of ionic crystals, we deal with
(a) Formula mass (b) Molecular mass (c) Both a and b (d) None of them

82. In structure of NaC*l*, each sodium ion is surrounded by how many chloride ions?
(a) 2 (b) 4 (c) 6 (d) 8

83. I–I bond distance is
(a) 271.5 pm (b) 271.5 nm (c) 271.5 um (d) 271.5 mm

84. The first theory of metallic bonding is called
(a) Electron pool theory (b) Electron gas theory
(c) Both a and b (d) None of them

85. Which of the following is a pseudo solid?
(a) CaF_2 (b) Glass (c) NaC*l* (d) All

ANSWERS

1.	b	2.	c	3.	a	4.	d	5.	a	6.	a	7.	c
8.	b	9.	c	10.	c	11.	d	12.	d	13.	b	14.	a
15.	a	16.	a	17.	a	18.	c	19.	d	20.	d	21.	a
22.	a	23.	c	24.	a	25.	b	26.	a	27.	c	28.	a
29.	d	30.	a	31.	a	32.	b	33.	a	34.	a	35.	b
36.	a	37.	b	38.	b	39.	c	40.	a	41.	d	42.	b
43.	a	44.	b	45.	a	46.	c	47.	a	48.	a	49.	d
50.	d	51.	c	52.	b	53.	a	54.	a	55.	b	56.	b
57.	a	58.	a	59.	c	60.	c	61.	b	62.	a	63.	b
64.	a	65.	d	66.	a	67.	d	68.	a	69.	b	70.	c
71.	c	72.	c	73.	b	74.	a	75.	b	76.	a	77.	c
78.	c	79.	b	80.	c	81.	a	82.	c	83.	b	84.	c
85.	b												

THERMO-CHEMISTRY

1. **The Greek word "THERM" means**
(a) Heat (b) Heat stable (c) Heat unstable (d) All of them
2. **Branch of chemistry which deals with heat changes during chemical reaction is called**
(a) Thermochemical (b) Thermostatics (c) Thermodynamics (d) Thermochemistry
3. **During chemical reaction, energy in form of heat is**
(a) Evolved or absorbed (b) Released or absorbed
(c) Emitted or absorbed (d) All of them
4. **During bond formation, energy is**
(a) Released (b) Increased (c) Decreased (d) Both a and c
5. **During bond breakage, energy is**
(a) Absorbed (b) Increased (c) Decreased (d) Both a and b
6. **Total energy of product is ________ to reactants.**
(a) Equal (b) Unequal (c) Both a and b (d) None of them
7. **A reaction in which heat is evolved or absorbed is called**
(a) Thermal reaction (b) Thermo reaction (c) Heat of reaction (d) All of them
8. **A chemical reaction in which heat is evolved is called**
(a) Exothermic (b) Endothermic (c) Both a and b (d) None of them
9. **A chemical reaction in which heat is absorbed is called**
(a) Exothermic (b) Endothermic (c) Both a and b (d) None of them
10. **For exothermic reaction, the value of ΔH is**
(a) +ve (b) -ve
(c) Neither +ve nor –ve (d) None of them
11. **For endothermic reaction, the value of ΔH is**
(a) +ve (b) -ve
(c) Neither +ve nor –ve (d) None of them
12. **During exothermic reaction, energy of the surrounding is**
(a) Increased (b) Decreased
(c) Neither increased nor decreased (d) Both a and b
13. **During endothermic reaction, energy of the surrounding is**
(a) Increased (b) Decreased
(c) Neither increased nor decreased (d) Both a and b
14. **During exothermic reaction, energy of the system is**
(a) Increased (b) Decreased
(c) Neither increased nor decreased (d) Both a and b

15. **During endothermic reaction, energy of the system is____.**
(a) Increased (b) Decreased
(c) Neither increased nor decreased (d) Both a and b

16. **Combustion of coal is ________ reaction.**
(a) Exothermic (b) Endothermic (c) Both a and b (d) None of them

17. **Formation of water is ________ reaction.**
(a) Exothermic (b) Endothermic (c) Both a and b (d) None of them

18. **Formation of ammonia is ________ reaction.**
(a) Exothermic (b) Endothermic (c) Both a and b (d) None of them

19. **Decomposition of water is ________ reaction.**
(a) Exothermic (b) Endothermic (c) Both a and b (d) None of them

20. **Formation of nitrogen is ________ reaction.**
(a) Exothermic (b) Endothermic (c) Both a and b (d) None of them

21. **For combustion of coal, the value of ΔH is______.**
(a) 393.7 kj/mol (b) 392.7 kj/mol (c) -393.7 kj/mol (d) -392.7 kj/mol

22. **Thermochemistry is based on**
(a) 1st law of thermodynamics (b) 2nd law of thermodynamics
(c) Both a and b (d) None of them

23. **Thermochemistry gives us the knowledge about**
(a) Heat content (b) Chemical bonding
(c) Chemical equilibrium (d) All of them

24. **Spontaneous reactions are those which are**
(a) Unidirectional (b) Bidirectional (c) Both a and b (d) None of them

25. **Non-spontaneous reactions are those which are**
(a) Irreversible (b) Reversible (c) Both a and b (d) None of them

26. **Spontaneous reactions is _____ process.**
(a) Natural (b) Synthetic (c) Artificial (d) Unnatural

27. **Neutralization is __________ reaction.**
(a) Spontaneous (b) Non-Spontaneous (c) Both a and b (d) None of them

28. **Calorie is equivalent to**
(a) 0.4184 J (b) 41.84 J (c) 4.184 J (d) 418.4 J

29. **Burning of coal in the presence of air is called**
(a) Spontaneous (b) Non-Spontaneous (c) Both a and b (d) None of them

30. **Example of non-spontaneous reaction is**
(a) Pumping of water uphill (b) Heat transference
(c) Formation of nitrogen oxide (d) All of them

31. **For spontaneous reaction, the value of ΔH is**
(a) +ve (b) -ve (c) Neither +ve nor –ve (d) None of them

32. **For non-spontaneous reaction, the value of ΔH is**
(a) +ve (b) -ve
(c) Neither +ve nor –ve (d) None of them

33. **Conversion of water into steam is an example of**
(a) Spontaneous reaction (b) Non-spontaneous reaction
(c) Both a and b (d) None of them

34. **Anything in the universe which is under consideration is called**
(a) System (b) Surrounding (c) Boundary (d) None of them

35. **Anything in the universe except system is called**
(a) State (b) Surrounding (c) Boundary (d) None of them

36. **Imaginary surface separating the system from surrounding is called**
(a) System (b) Surrounding (c) Boundary (d) None of them

37. **The condition of system is called**
(a) Property (b) State (c) State function (d) All of them

38. **A state function is**
(a) Macroscopic property of a system (b) Dependent on initial and final states
(c) Independent of path adopted to bring about change
(d) All of them

39. **The kinetic energy of particles is due to**
(a) Vibrational, translational and rotational movements
(b) Uniform and instantaneous movements
(c) Uniform and average movements (d) All of them

40. **Solid particles exhibit**
(a) Vibrational movement (b) Translational movement
(c) Rotational movement (d) All of them

41. **When heat is absorbed from system, the value of 'q' is**
(a) +ve (b) -ve
(c) Neither +ve nor –ve (d) None of them

42. **When heat is absorbed by system, the value of 'q' is**
(a) +ve (b) -ve
(c) Neither +ve nor –ve (d) None of them

43. **Mathematical expression for change in internal energy is**
(a) $\Delta E = q + w$ (b) $\Delta E = q + P\Delta V$ (c) $\Delta E = q_v$ (d) All of them

44. **Enthalpy is a**
(a) State function (b) Total heat contents of system
(c) Both a and b (d) None of them

45. **Enthalpy is measured in**
(a) Pascals (b) Newtons (c) Dynes (d) Joules

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46. $H^+_{(aq)} + OH^-_{(aq)} \rightarrow H_2O \quad \Delta H^\circ_n = ?$

(a) 57.4 kj/mole (b) -57.4 kj/mole (c) 54.7 kj/mole (d) -54.7 kj/mole

47. **For enthalpy of combustion, the value of ΔH°_c is**

(a) +ve (b) -ve
(c) Neither +ve nor –ve (d) None of them

48. **Combustion of ethanol gives**

(a) $CO + H_2$ (b) $CO + H_2O$ (c) $CO_2 + H_2$ (d) $CO_2 + H_2O$

49. **Formation of ammonium chloride solution is an example of**

(a) Exothermic (b) Endothermic (c) Both a and b (d) None of them

50. **Quantity of heat evolved or absorbed during reaction is calculated by following formula from calorimeter**

(a) $m \times s \times \Delta T$ (b) $m \times s \times T$ (c) Both a and b. (d) None of them

51. **Hess's law applies to______.**

(a) Binary ionic compounds (b) Tertiary ionic compounds
(c) Quaternary ionic compounds (d) All of them

52. **The enthalpy of formation of one mole of ionic compound form gaseous ions under standard conditions is called**

(a) Ionization energy (b) Electron affinity (c) Shielding effect (d) Lattice energy

53. **Enthalpy of lattice energy of sodium chloride is**

(a) 774 kj/mol (b) 776 kj/mol (c) -774 kj/mol (d) -776 kj/mol

54. **Which of the following statements is contrary to first law of thermodynamics?**

(a) Energy can neither be created nor destroyed
(b) One form of energy can be transferred into an equivalent amount of other kinds of energy
(c) In an adiabatic process, work done is independent of its path
(d) Continuous production of mechanical work without supplying an equivalent amount of heat is possible

ANSWERS

1.	a	2.	d	3.	d	4.	d	5.	d	6.	b	7.	c
8.	a	9.	b	10.	b	11.	a	12.	a	13.	b	14.	b
15.	a	16.	a	17.	a	18.	a	19.	b	20.	b	21.	c
22.	a	23.	a	24.	a	25.	b	26.	a	27.	a	28.	c
29.	a	30.	d	31.	b	32.	a	33.	b	34.	a	35.	b
36.	c	37.	b	38.	d	39.	a	40.	a	41.	b	42.	a
43.	d	44.	c	45.	d	46.	b	47.	b	48.	d	49.	b
50.	a	51.	a	52.	d	53.	d	54.	b				

ELECTROCHEMISTRY

1. **In a lead storage battery, the product of both ________ reactions are the same substance, which is $PbSO_4$.**
   (a) Cathode
   (b) Anode
   (c) Cat'ode and an anode
   (d) None of these
2. **The oxidation number of nitrogen in N_2 is________**
   (a) 14 (b) 0 (c) 16 (d) 18
3. **The fuel cell forms________.**
   (a) Hydrogen (b) Oxygen (c) Sulphuric acid (d) Water
4. **If given the redox reaction**
   $Mg_{(s)} + CuSO_{4(aq)} \longrightarrow MgSO_{4(aq)} + Cu_{(s)}$
   What acts as the oxidising agent?
   (a) Magnesium
   (b) Copper
   (c) Copper sulphate
   (d) Magnesium sulphate
5. **Redox reaction constantly exposes the conservation of**
   (a) Mass and time
   (b) Charge and time
   (c) Both mass and charge
   (d) None of these
6. **We are given an euation**
   $3\,Sn^{4+}_{(aq)} + 2\,Cr_{(s)} \longrightarrow 3\,Sn^{2+}_{(aq)} + 2\,Cr^{3+}_{(aq)}$
   Then tell which half-reaction signifies the reduction that take place?
   (a) $Sn^{4+}_{(aq)} + 2\,e^- \longrightarrow Sn^{2+}_{(aq)}$
   (b) $Sn^{4+}_{(aq)} + 3e^- \longrightarrow 2Sn^{2+}_{(aq)}$
   (c) $Sn^{4+}_{(aq)} + 4\,e^- \longrightarrow 4Sn^{2+}_{(aq)}$
   (d) $Sn^{4+}_{(aq)} + 5\,e^- \longrightarrow 5Sn^{2+}_{(aq)}$
7. **In the reaction**
   $Zn_{(s)} + 2\,HCl_{(aq)} \longrightarrow ZnCl_{2(aq)} + H_{2(g)}$
   Then the substance ionised is________.
   (a) Zinc (b) Hydrochloric acid (c) Chlorine (d) Hydrogen
8. **The given reaction is balanced**
   $2\,Al_{(s)} + 6\,H^+_{(aq)} \longrightarrow 2\,Al^{3+}_{(aq)} + 3\,H_{2(aq)}$
   How many numbers of moles of electrons is increased by H^+ when two moles of aluminum are wholly reacted?
   (a) 6 (b) 8 (c) 10 (d) 15
9. **The main reason of MnO_2 and $ZnCl_2$ at the cathode of dry cell is to stop collection of gases ________.**
   (a) N_2 and NH_3 (b) Cl_2 and NH_3 (c) H_2 and N_2 (d) H_2 and NH_3

10. **Identify the correct order from strongest to weakest.**
   (a) Nuclear , gravitational, covalent and finally London dispersion
   (n) Gravitational, nuclear , covalent and finally London dispersion
   (c) Gravitational, covalent, nuclear and finally London dispersion
   (d) None of these

11. **The loss of mass in combining _________ particles is transformed into neutrons.**
   (a) Alpha (b) Beta (c) Gama (d) Elementary

12. **If symbolic nuclide depiction is $^{209}_{83}X$, then X is equal to**
   (a) Na (b) Bi (c) Mg (d) Pb

13. **In the nuclide ^{186}Re, _________ different elementary particles are created.**
   (a) 83 protons, 83 neutrons (b) 85 protons, 86 neutrons
   (c) 75 protons, 75 neutrons (d) 86 protons, 86 neutrons

14. **In the following fission reaction**
   $^{236}U \rightarrow {}^{144}Cs + {}^{204}Pb + ? + \text{energy}$
   (a) $2\,^{2}n$ (b) $2\,^{3}n$ (c) $2\,^{4}n$ (d) $2\,^{1}n$

15. **In the following fission reaction**
   $^{40}K \rightarrow ? + {}^{40}Ca$
   (a) Neutral particle (b) Alpha particle (c) Beta particle (d) None of these

16. **From a nuclear, reaction _________ naturally has the maximum diffusion capability.**
   (a) Neutrons (b) Positive particles (c) Negative particals (d) Neon particles

17. **_________-have a propensity to emit beta particles.**
   (a) Protons (b) Neutron-rich nuclei
   (c) Alpha particals (d) Beta particals

18. **_________-tend to emit beta particles.**
   (a) Alpha particles (b) Neutron-poor nuclei
   (c) Gamma particles (d) None of these

19. **In an electrolytic cell, the negative electrode is called the cathode, at which _________ occurs.**
   (a) Oxidation (b) Reaction (c) Corrosion (d) Reduction

20. **What is the function of the salt bridge in an electrochemical cell?**
   (a) It does not permit the passage of ions between the half-cells
   (b) It permits the passage of only positive ions between the half-cells
   (c) It permits the passage of ions between the half-cells
   (d) It permits the passage of only negative ions between the half-cells

ANSWERS

1.	c	2.	b	3.	d	4.	b	5.	c	6.	a	7.	a
8.	a	9.	d	10.	a	11.	d	12.	b	13.	c	14.	d
15.	b	16.	a	17.	b	18.	b	19.	d	20.	c		

STOICHIOMETRY

1. **A mole is a measure of the amount of__________.**
   (a) Substance (b) Weight (c) Mass (d) None of these
2. **STP stands for and its conditions are**
   (a) Standard temperature and pressure, 10 degrees Celsius, 10 atm
   (b) Standard temperature and pressure, 0 degrees Celsius, 1 atm
   (c) Standard temperature, 25 degrees Celsius, 100 atm
   (d) Standard temperature, 25 degreee Celsius, 100 atm
3. **Balancing the equation is the __________to solve a problem in stoichiometry.**
   (a) First step (b) Second step (c) Third step (d) Last step
4. **Ammonium nitrate crumbles according to the following equation: $NH_4NO_3 \rightarrow N_2 + H_2O + O_2$**
   Now you start with 8 moles of NH_4NO_3, how much O_2 will be produced?
   (a) 100 grams (b) 122 grams (c) 128 grams (d) 130 grams
5. **$CO(g) + 2H_2(g) \rightarrow CH_3OH(g)$**
   How much volume of hydrogen is required to react entirely with 8.02×10^{23} molecules of carbon monoxide?
   (a) 68.7 L (b) 60.8 L (c) 59.7 L (d) 52.4 L
6. **$2KClO_3(s) \rightarrow 2KCl(s) + 3O_2(g)$**
   If the per cent yield is 40%, how various atoms of oxygen are shaped from 6.02×10^{23} formula units of $KClO_3$?
   (a) 1.1708×10^{26} (b) 1.809×10^{25} (c) 1.806×10^{24} (d) none of these
7. **$C(s) + O_2(g) \rightarrow CO_2(g) + 393.5$ kJ. What kind of reaction is this?**
   (a) Exothermic (b) Endothermic (c) Neutral (d) None of these
8. **$SO_3(g) + H_2O(l) \rightarrow H_2SO_4(aq) + 129.6$ kJ at STP**
   Now if 540 kJ is unconfined, what volume of SO_3 (g) was initially added?
   (a) 71.3 L (b) 81.3 L (c) 93.3 L (d) 99.3 L
9. **What is the exact equation for heat of reaction?**
   (a) $\delta H + \delta H(\text{products}) = \delta H(\text{reactants})$ (b) $\delta H - \delta H(\text{reactants}) + \delta H(\text{products})$
   (c) $\delta H = \delta H\ f(\text{products}) - \delta H\ f(\text{reactants})$ (d) None of these
10. **If we had 1 mole of NaCl and put it in 2 L of solution, then which statement false?**
    (a) 0.5 M solution is formed (b) 0.5 M solution of chlorine is formed
    (c) I have 22.4 L of solution (d) None of these

ANSWERS

1.	a	2.	b	3.	a	4.	c	5.	c	6.	c	7.	a
8.	c	9.	c	10.	c								

CHEMICAL BONDING

SET – I

1. **The bond which is produced in the consequence of complete transference of electrons is known as_________**
   (a) Ionic bond
   (b) Covalent bond
   (c) Coordinate covalent bond
   (d) Hydrogen bond
2. **The bond which is created by mutual sharing of electrons are called as _________.**
   (a) Ionic bond (b) Hydrogen bond (c) Covalent bond (d) None of them
3. **The bond which is the consequence of the configuration of NaCl is called as _________.**
   (a) Electrovalent bond (b) Hydrogen bond (c) Pai bond (d) Covalent bond
4. **The bond stuck between metals and non metals is called ______.**
   (a) Ionic bond
   (b) Covalent bond
   (c) Double covalent bond
   (d) Triple covalent bond
5. **_________ discovered Ionic bond.**
   (a) W.Kossel
   (b) Walter Norman Haworth
   (c) Dudley R. Herschbach
   (d) Jaroslav Heyrovsky
6. **_________discovered covalent bond.**
   (a) Joel Henry Hildebrand
   (b) Dorothy Mary Crowfoot Hodgkin
   (c) August Wilhelm von Hofmann
   (d) G.N Lewis
7. **If _________is shared by the bonded atoms, the bond form will be single covalent bond.**
   (a) One pair of electrons
   (b) Two pairs of electrons
   (c) Three pairs of electrons
   (d) None of these
8. **_______ __- element form double covalent bond .**
   (a) Nitrogen (b) Oxygen (c) Chlorine (d) Bromine
9. **When hydrogen reacts with chlorine to form hydrochloric acid, then _____ _____-bond is created between them.**
   (a) Single covalent bond
   (b) Double covalent bond
   (c) Triple covalent bond
   (d) None of them

ANSWERS

1.	a	2.	c	3.	a	4.	a	5.	a	6.	d	7.	a
8.	b	9.	a										

SET – II

1. **The force which holds together two or more atoms or ions to form a large variety of compounds is called**
   (a) Chemical bond (b) Ionization energy (c) Electron affinity (d) None of them
2. **Chemical bond is responsible for**
   (a) Chemical combination (b) Shape of molecules
   (c) Both a and b (d) None of them
3. **The chemical reactivity of elements depends upon**
   (a) Chemical combination (b) Shape of molecules
   (c) Both a and b. (d) None of them
4. **Arrangement of noble gases from top to bottom is group of periodic table is**
   (a) He, Ne, Ar, Kr, Xe, Rn (b) He, Ne, Kr, Ar, Xe, Rn
   (c) He, Ne, Xe, Ar, Kr, Rn (d) He, Ne, Ar, Rn, Kr, Xe
5. **Most stable elements in the periodic table are______.**
   (a) Alkali metals (b) Alkaline earth metals
   (c) Halogens (d) Inert gases
6. **The tendency of atoms to attain maximum of eight electrons in valence shell is called**
   (a) Octa rule (b) Octate rule (c) Octane rule (d) Octet rule
7. **Electronic configuration of magnesium before electron loss or gain is**
   (a) $1s^2, 2s^2, 2p^6, 3s^2$ (b) $1s^2, 2s^2, 2p^6$ (c) $1s^2, 2s^2, 2p^5$ (d) None of them
8. **Electronic configuration of magnesium after electron loss or gain is**
   (a) $1s^2, 2s^2, 2p^6, 3s^2$ (b) $1s^2, 2s^2, 2p^6$ (c) $1s^2, 2s^2, 2p^5$ (d) None of them
9. **Electronic configuration of fluorine before electron loss or gain is**
   (a) $1s^2, 2s^2, 2p^6, 3s^2$ (b) $1s^2, 2s^2, 2p^6$ (c) $1s^2, 2s^2, 2p^5$ (d) None of them
10. **Electronic configuration of fluorine after electron loss or gain is**
    (a) $1s^2, 2s^2, 2p^6, 3s^2$ (b) $1s^2, 2s^2, 2p^6$ (c) $1s^2, 2s^2, 2p^5$ (d) None of them
11. **What is the atomic number of helium?**
    (a) 2 (b) 8 (c) 10 (d) 18
12. **What is the atomic number of oxygen?**
    (a) 2 (b) 8 (c) 10 (d) 18
13. **What is the atomic number of neon?**
    (a) 2 (b) 8 (c) 10 (d) 18
14. **What is the atomic number of argon?**
    (a) 2 (b) 8 (c) 10 (d) 18
15. **On which compounds, octet rule is not applied?**
    (a) PF_5, CaO, CH_4 (b) PF_5, SF_6, CH_4 (c) PF_5, SF_6, BCl_5 (d) PF_5, SF_6, BCl_3
16. **During bond formation, energy of system**
    (a) Decreases (b) Increases (c) Remains constant (d) None of them

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17. **During bond breakage, energy of system**
(a) Decreases (b) Increase (c) Remains constant (d) None of them
18. **Atomic radii ______ from left to right in period of periodic table.**
(a) Increases (b) Decreases (c) Remains constant (d) None of them
19. **Vertical columns of periodic table are called**
(a) Periods (b) Groups (c) Period number (d) Group number
20. **Horizontal rows of periodic table are called**
(a) Periods (b) Groups (c) Period number (d) Group number
21. **Number of electrons in outermost shell of any atom is called**
(a) Periods (b) Groups (c) Period number (d) Group number
22. **Number of shells in any atom is called**
(a) Periods (b) Groups (c) Period number (d) Group number
23. **Which of the following statements is correct?**
(a) Number of shells increases from top to bottom in groups
(b) Number of shells decreases from top to bottom in groups
(c) Number of shells remains constant from top to bottom in groups
(d) None of them
24. **Which of the following statements is correct?**
(a) Number of electrons increases from left to right in periods
(b) Number of electrons decreases left to right in periods
(c) Number of electrons remains constant from left to right in periods
(d). None of them
25. **Which of the following statements is correct?**
(a) Atomic no. increases successively form left to right in periods
(b) Atomic no. decreases successively form left to right in periods
(c) Both a and b
(d) None of them
26. **Nuclear attraction for outermost shell**
(a) Increases from left to right in periods. (b) Decreases from top to bottom in periods
(c). Both a and b (d) None of them
27. **Atomic radii _____ from top to bottom in groups of periodic table.**
(a) Decrease (b) Increase (c) Remain constant (d) None of them
28. **Which effect is responsible for decrease in force of attraction of nucleus for electrons present in valence shell?**
(a) Shielding effect (b) Compton effect (c) Stark effect (d) All of them
29. **Ions are held together by**
(a) Electromagnetic force of attraction (b) Electrodynamic force of attraction
(c) Electrostatic force of attraction (d) Electroneutral force of attraction

30. **The ionic radius of cation is ______ than atomic radius of corresponding element.**
(a) Smaller (b) Larger
(c) Remained constant (d) None of them

31. **The ionic radius of anion is ______ than atomic radius of corresponding elements:**
(a) Smaller (b) Larger (c) Remained constant (d) None of them

32. **The ionic radius of anion is ______ than atomic radius of cation.**
(a) Smaller (b) Larger (c) Remained constant (d) None of them

33. **Which of the following cations has larger ionic radius?**
(a) Sodium ion (b) Magnesium ion (c) Aluminium ion (d) All of them

34. **Which of the following anions has larger ionic radius?**
(a) F^{1} (b) O^{-2} (c) N^{-3} (d) C^{-4}

35. **Covalent radius of hydrogen atom is**
(a) 38 pm (b) 76 pm (c) 77 pm (d) 78 pm

36. **Covalent radii of hydrogen molecule is**
(a) 38 pm (b) 76 pm (c) 77 pm (d) 78 pm

37. **The minimum energy required to remove an electron from its gaseous atom to form cation is called**
(a) Ionization energy (b) Electron affinity (c) Electronegativity (d) None of them

38. **Ionization energy is ______ process.**
(a) Exothermic (b) Endothermic (c) Both a and b (d) None of them

39. **Qualitative measurement for stability of an isolated atom is called**
(a) Ionization energy (b) Electron affinity (c) Electronegativity (d) None of them

40. **The factors affecting ionization energy are**
(a) Atomic radius, nuclear charge, Stark effect
(b) Atomic radius, nuclear charge, Zeeman effect
(c) Atomic radius, nuclear charge, Shielding effect
(d) None of them

41. **Covalent bond formed between dissimilar atoms is called**
(a) Polar bond (b) Non-polar bond (c) Semi bond (d) None of them

42. **If ΔEN is greater than 1.7, the bond is**
(a) Ionic (b) Covalent
(c) Co-ordinate covalent (d) Both a and b

43. **If ΔEN is lesser than 1.7, the bond is**
(a) Ionic (b) Covalent
(c) Co-ordinate covalent (d) Both a and b

44. **If ΔEN is equal to 1.7, the bond is**
(a) Ionic (b) Covalent
(c) Co-ordinate covalent (d) Both a and b

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45. **Which of the following compounds is non polar?**
(a) H_2 (b) Cl_2 (c) CCl_4 (d) All of them

46. **Which of the following compounds is non-polar?**
(a) H_2O (b) CH_3OH (c) CO_2 (d) CH_3Cl

47. **N_2 is an inert gas having strong**
(a) Single bond (b) Double bond (c) Triple bond (d) None of them

48. **Molecular formula of disilane is**
(a) Si_2H_2 (b) Si_2H_4 (c) Si_2H_6 (d) Si_2H_8

49. **Ethyne contains _______ between C-C.**
(a) Single bond (b) Double bond (c) Triple bond (d) None of them

50. **Bond formed between two atoms when shared pair of electrons is donated by one of bonded atoms is called**
(a) Covalent bond (b) Co-ordinate covalent bond
(c) Polar bond (d) Non-polar bond

51. **VSERP theory hold good for**
(a) Non-transition elements (b) Transition elements
(c) Both a and b (d) None of them

52. **If bond angle between atoms is 180° then the molecular structure is**
(a) Linear (b) Triangular (c) Tetrahedral (d) None of them

53. **If bond angle between atoms is 120° then molecular structure is**
(a) Linear (b) Triangular (c) Tetrahedral (d) None of them

54. **If bond angle between atoms is 109.5° then molecular structure is**
(a) Linear (b) Triangular (c) Tetrahedral (d) None of them

55. **Hybridization and VSERP concepts predict same symmetrical tetrahedral structure for**
(a) Methane (b) Ethane (c) Ethene (d) Ethyne

56. **Number of electrons in BMO for Nitrogen molecule is**
(a) Two (b) Four (c) Six (d) Ten

57. **Number of electrons in BMO for oxygen molecule is**
(a) Two (b) Four (c) Six (d) Ten

58. **H – H bond energy is**
(a) 430 kj/mol (b) 431 kj/mol (c) 432 kj/mol (d) 433 kj/mol

59. **The factors affecting bond energy are**
(a) Electronegativity, ionization energy, electron affinity
(b) Electronegativity, size of atoms, electron affinity
(c) Electronegativity, size of atoms, bond length
(d) None of them

60. **The bonds with higher bond energy values have _______ bond lengths.**
(a) Greater (b) Shorter (c) Both a and b (d) None of them

61. **During solubility of ionic compounds, ions of solute are freed from crystal lattice by**
(a) Electrostatic force (b) Lattice energy (c) Hydration (d) All of them

62. **During solubility of ionic compounds, hydration occurs when**
(a) Hydration energy is equal to lattice energy
(b) Hydration energy is lesser than lattice energy
(c) Hydration energy is greater than lattice energy
(d) None of them

63. **Ionic compounds do not exhibit the phenomenon of isomerism due to**
(a) Insolubility of ionic compounds in non-aqueous solvent
(b) Non-rigid and non-directional bonds in ionic compounds
(c) Rapid chemical reactions of ionic compounds
(d) None of them

64. **Covalent compounds exhibit the phenomenon of isomerism due to**
(a) Insolubility of covalent compounds in water
(b) Rapid and directional bonds in covalent compounds
(c) Slow chemical reactions of covalent compounds
(d) None of them

65. **The paramagnetic property of O_2 is due to presence of ______ electrons in two molecular orbitals.**
(a) Paired (b) Unpaired (c) Both a and b (d) None of them

ANSWERS

1.	a	2.	c	3.	c	4.	a	5.	d	6.	d	7.	a
8.	b	9.	c	10.	b	11.	a	12.	b	13.	c	14.	d
15.	d	16.	a	17.	b	18.	b	19.	b	20.	a	21.	d
22.	c	23.	a	24.	a	25.	a	26.	c	27.	b	28.	a
29.	c	30.	a	31.	b	32.	b	33.	a	34.	a	35.	a
36.	b	37.	a	38.	b	39.	a	40.	c	41.	a	42.	a
43.	b	44.	d	45.	b	46.	c	47.	c	48.	c	49.	c
50.	b	51.	a	52.	a	53.	b	54.	c	55.	a	56.	d
57.	d	58.	b	59.	c	60.	b	61.	c	62.	c	63.	b
64.	b	65.	b										

CHEMICAL EQUILIBRIUM

1. **A chemical reaction in which products of reaction do not react to form original reactants under same set of conditions is called**
   (a) Irreversible reaction (b) Reversible reaction
   (c) Both a and b (d) None of them
2. **A chemical reaction in which products of reaction react to form original reactants under same set of conditions is called**
   (a) Irreversible reaction (b) Reversible reaction
   (c) Both a and b (d) None of them
3. **Formation of sodium hydroxide and hydrogen gas is an example of**
   (a) Irreversible reaction (b) Reversible reaction
   (c) Both a and b (d) None of them
4. **Formation of water is an example of**
   (a) Irreversible reaction (b) Reversible reaction
   (c) Both a and b (d) None of them
5. **Formation of ammonia is an example of**
   (a) Irreversible reaction (b) Reversible reaction
   (c) Both a and b (d) None of them
6. **For Haber-Bosch ammonia process temperature should be**
   (a) 350° C (b) 400° C (c) 450° C (d) 500° C
7. **For Haber-Bosch ammonia process, catalyst is**
   (a) Ni (b) Fe (c) Cr (d) Pb
8. **In Haber-Bosch ammonia is manufactured under**
   (a) Low pressure (b) High pressure (c) Moderate pressure (d) None of them
9. **Reversible reactions can occur at**
   (a) High pressure (b) Low pressure (c) Both a and b (d) None of them
10. **Water is decomposed into hydrogen gas and oxygen gas at**
    (a) 500° C (b) 1000° C (c) 1500° C (d) 2000° C
11. **Hydrogen gas and iodine vapours combine to from hydrogen iodide at**
    (a) 400° C (b) 425° C (c) 450° C (d) 500° C
12. **Law of mass action was proposed by______.**
    (a) Goldberg (b) Waage (c) Both a and b (d) None of them
13. **Law of mass action states that**
    (a) Rate of reaction is directly proportion to product of active masses of reactants
    (b) Rate of reaction is inversely proportional to product of active masses of reactants

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(c) Rate of reaction is directly proportional to product of active masses of products
(d) Rate of reaction is inversely proportional to product of active masses of products

14. **Unit of concentration of active masses is**
(a) mole/dm^3 (b) dm^3/mole (c) Both a and b (d) None of them

15. **Equilibrium constant is defined as**
(a) Ratio of conc. of products to conc. of reactants
(b) Ratio of conc. of reactants to conc. of products
(c) Both a and b (d) None of them

16. **Equilibrium constant for esterification is**
(a) $\frac{[C_2H_5OH][CH_3COOH]}{[CH_3COOC_2H_5][H_2O]}$ (b) $\frac{[CH_3COOC_2H_5][H_2O]}{[C_2H_5OH][CH_3COOH]}$
(c) $\frac{[CH_3COOC_2H_5]}{[C_2H_5OH][CH_3COOH]}$ (d) $\frac{[C_2H_5OH][CH_3COOH]}{[CH_3COOC_2H_5]}$

17. **Equilibrium constant for formation of ammonia is**
(a) $\frac{[NH_3]}{[N_2][H_2]}$ (b) $\frac{[NH_3]^2}{[N_2][H_2]}$ (c) $\frac{[NH_3]^3}{[N_2][H_2]^2}$ (d) $\frac{[NH_3]^2}{[N_2][H_2]^3}$

18. **Numerical value for k_c of esterification is**
(a) $\frac{x^2}{(a-x)(b-x)}$ (b) $\frac{(a-x)(b-x)}{x^2}$ (c) $\frac{4x^2}{(a-x)(b-x)}$ (d) $\frac{(a-x)(b-x)}{4x^2}$

19. **Numerical value for k_c of dissociation of PC□$_5$ is**
(a) $\frac{v(a-x)}{x^2}$ (b) $\frac{x^2}{v(a-x)}$ (c) $\frac{x^2}{av-xv}$ (d) None of them

20. **Numerical value for k_c of dissociation of N_2O_4 is**
(a) $\frac{4x^2}{v(a-2x)}$ (b) $\frac{4x^2}{v(a-x)}$ (c) $\frac{x^2}{v(a-2x)}$ (d) $\frac{x^2}{v(a-x)}$

21. **Reaction is shitted to backward direction by**
(a) Addition of substance among products (b) Removal of substance among reactants
(c) Addition of substance among reactants (d) Both a and b

22. **Potassium iodide dissolves in water and**
(a) Absorbs heat (b) Releases heat (c) Both a and b (d) None of them

23. **______ will favour crystallization of salt.**
(a) Cooling (b) Over-cooling (c) Super-cooling (d) None of them

24. **The heat of solution for NaCl is close to**
(a) Zero (b) 10 (c) 20 (d) 30

25. **Maximum yield of ammonia is obtained by**
(a) High pressure, high temperature and continual addition of ammonia
(b) Low pressure, low temperature and continual removal of ammonia
(c) High pressure, low temperature and continual removal of ammonia
(d) High pressure, low temperature and continual addition of ammonia

26. **If pH < 7, the solution is**
(a) Neutral (b) Acidic (c) Basic (d) None of them

27. **If pH > 7, the solution is**
(a) Neutral (b) Acidic (c) Basic (d) None of them

28. **What is the pH of gastric juice?**
(a) 2 (b) 4 (c) 6 (d) 8

29. **What is the pH of milk of magnesia?**
(a) 9.5 (b) 10.5 (c) 11.5 (d) 12.5

30. **If $K_a < 10^{-3}$, the acid is**
(a) Weak (b) Moderately strong (c) Strong (d) None of them

31. **Which is the strongest base?**
(a) NaOH (b) KOH (c) $Ca(OH)_2$ (d) NH_4OH

32. **Positive part of a base is called**
(a) Conjugate acid (b) Conjugate base (c) Conjugate salt (d) None of them

33. **Negative part of an acid is called**
(a) Conjugate acid (b) Conjugate base (c) Conjugate salt (d) None of them

34. **Conjugate base of very weak acid is relatively**
(a) Very strong base (b) Very strong acid (c) Very weak base (d) Very weak acid

35. **Conjugate base of very strong base is relatively**
(a) Very strong base (b) Very strong acid (c) Very weak base (d) Very weak acid

36. **pH of human blood is**
(a) 5.35 (b) 6.35 (c) 7.35 (d) 8.35

37. **A person may die, if pH goes to**
(a) 6 – 7 (b) 7 – 8 (c) 8 – 9 (d) 9 – 10

38. **Henderson's equation for base is**
(a) $pOH = pk_a + \log\frac{[Salt]}{[Base]}$ (b) $pOH = k_a + \log\frac{[Salt]}{[Base]}$
(c) $pOH = pk_a + \log\frac{[Base]}{[Salt]}$ (d) $pOH = k_a + \log\frac{[Base]}{[Salt]}$

39. **Capability of buffer to resist change in pH is called**
(a) Buffer action (b) Buffer capacity (c) Buffer potential (d) Buffer afficacy

40. **Which of the following compounds is sparingly soluble in water?**
(a) NaCℓ (b) $CaCO_3$ (c) $PbSO_4$ (d) NaOH

41. **For which system does equilibrium constant (K_c) has units of concentration^{-1}?**
(a) $N_2 + 3H_2 \rightleftharpoons 2NH_3$
(b) $H_2 + I_2 \rightleftharpoons 2HI$
(c) $2HF \rightleftharpoons H_2 + F_2$
(d) None of them

42. **The pH of 10^{-3} mol.dm^{-3} of an aqueous solution of H_2SO_4 is**
(a) 3 (b) 2.7 (c) 2 (d) 1.5

43. **The Ksp for AgCℓ is 2×10-10 mol2.dm-6. The maximum concentration of Ag+ ions in solution is**
(a) 2×10^{-10} mol.dm^{-3} (b) 1.41×10^{-5} mol.dm^{-3} (c) 1×10^{-10} mol.dm^{-3} (d) 4×10^{-20} mol.dm^{-3}

44. **An excess of aqueous $AgNO_3$ is added to aqueous $BaCl_2$ and precipitate is removed by filteration. What are main ions in filterate?**
(a) Ag^+, NO_3^- (b) Ag^+, Ba^{+2}, NO_3^- (c) Ba^{+2}, NO_3^- (d) Ba^{+2}, NO_3^-, Cl^-

45. **When a graph is plotted between time and concentrations of reactants and products for reversible reaction**
(a) The curves become parallel to x-axis
(b) The curves become non-parallel to x-axis
(c) The curves become parallel to y-axis
(d) None of them

ANSWERS

1.	a	2.	b	3.	a	4.	a	5.	b	6.	c	7.	b
8.	b	9.	b	10.	d	11.	b	12.	c	13.	a	14.	a
15.	a	16.	b	17.	d	18.	a	19.	d	20.	a	21.	d
22.	a	23.	a	24.	a	25.	c	26.	b	27.	c	28.	a
29.	b	30.	a	31.	a	32.	a	33.	b	34.	a	35.	d
36.	c	37.	b	38.	a	39.	b	40.	c	41.	a	42.	a
43.	a	44.	c	45.	a								

TRANSITION ELEMENTS

1. **The ____ elements are called transition elements.**
   (a) p-block (b) d-block (c) f-block (d) Both b and c
2. **What is the atomic number of Ni?**
   (a) 23 (b) 56 (c) 8 (d) 78
3. **What is the electronic configuration of Cr?**
   (a) [Ar] $3d^3 4S^1$ (b) [Ar] $3d^5 4S^2$ (c) [Ar] $3d^6 4S^2$ (d) None of them
4. **The atomic number of Cd is**
   (a) 48 (b) 80 (c) 27 (d) None of them
5. **In chromium one electron form s-subshell has been used to ______ fill d-subshell.**
   (a) Full (b) Half (c) One quarter (d) None of them
6. **In copper one electron from S-subshell has gone to _____ to fill it completely.**
   (a) d-subshell (b) f-subshell (c) p-subshell (d) None of them
7. **Which one of the following elements don't have a partially filled d-subshell?**
   (a) Zn,Cu, Au (b) Zn, Cd, Hg (c) Au, Cu, Fe (d) None of them
8. **Which one of the following elements don't show properties of associated with typical transition elements?**
   (a) Sc, Y, La (b) Au, Cu, Fe (c) Zn, Cu, Cd (d) None of them
9. **Transition compounds which occur as tripositive ions have no**
   (a) s-electron (b) p-electron (c) d-electron (d) f-electron
10. **Which of the following groups are referred to as non-typical transition elements?**
    (a) II B (b) I B (c) III B (d) Both a and c
11. **Except non-typical transition elements remaining transition series are called**
    (a) True transition element (b) Outer transition
    (c) Inner transition (d) Typical transition element
12. **Which of the following are coinage metal?**
    (a) Cu (b) Ag (c) Au (d) All of them
13. **Ag^{+2} has configuration**
    (a) $3d^9$ (b) $4d^9$ (c) $5d^8$ (d) $5d^9$
14. **Lanthanides and actinides series are elements of**
    (a) s-block elements (b) p-block elements (c) p-block elements (d) f-block elements
15. **f-block elements are called as**
    (a) Inner transition elements (b) Outer transition elements
    (c) Typical transition elements (d) None of them

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16. **d-block elements are called as**
(a) Inner transition elements (b) Outer transitional elements
(c) Typical transition elements (d) None of them

17. **The d-block elements closely resemble one another in their physical and chemical properties because of**
(a) Similar atomic no. (b) Similar electronic configuration
(c) Similar atomic wt. (d) None of them

18. **Transition elements are**
(a) Hard metals (b) Soft metals (c) Strong metals (d) Both a and c

19. **Transition elements are _______ conductors of heat and electricity.**
(a) Good (b) Bad (c) Normal (d) None of them

20. **Which one of the following show variable valencies?**
(a) s-block elements (b) p-block elements
(c) Transition elements (d) None of them

21. **+2 oxidation state is shown in transition elements when _______ electrons are involved in bonding.**
(a) 2s (b) 3s (c) 2p (d) 2d

22. **Which of the following are responsible for the colour developed in transition elements compounds?**
(a) s-orbitals (b) p-orbitals (c) d-orbitals (d) f-orbitals

23. **The energy difference of d-orbitals varies from**
(a) Atom to atom (b) Ion to ion
(c) Electron to electron (d) None of them

24. **$[Ti(H_2O)_6]^3$ ions is ______ in colour.**
(a) Yellow (b) Blue (c) Red (d) Violet

25. **Interstitial compounds are ______ compounds.**
(a) Non-stoichiometric (b) Stoichiometric
(c) Both a and b (d) None of them

26. **Which of the following is used to give shell more useful properties?**
(a) Cr (b) Mn (c) Ni (d) All of them

27. **Which one of the following is called complex ion in the following equation?**
$Fe(CN)_2 + 4KCN \longrightarrow K_4[Fe(CN)_6] \xrightarrow{ionization} 4K^+ + [Fe(CN)6]^{-4}$
(a) $[Fe(CN)_6]^{-4}$ (b) $K_4[Fe(N)_6]$ (c) KCN (d) K^+

28. **Compounds containing the complex molecules or complex ions, capable of independent existence are called**
(a) Coordination compounds (b) Complexes
(c) Ligands (d) Both a and b

29. A complex compound may contain
(a) A simple cation and a complex anion
(b) A complex cation and a simple anion
(c) Both a and b
(d) None of them

30. Which one of the following is example of central metal atom on ion in $K_4[Fe(CN)_6]$, $[Ag(NH_3)_2]$ Cl?
(a) Fe, Ag
(b) Ag, Cl
(c) Cl, Fe
(d) Both a and b

31. What is the formula of haematite?
(a) Fe_3O_4
(b) $Fe_2O_3 . 3H_2O$
(c) Fe_2O_3
(d) None of them

32. Limonite has formula
(a) Fe_3O_4
(b) $Fe_2O_3\ 3H_2O$
(c) Fe_2O_3
(d) None of them

33. ______ has been known since prehistoric days.
(a) Iron
(b) Magnet
(c) Steel
(d) All of them

34. When iron was used in Egypt?
(a) 1600 BC
(b) 1800 BC
(c) 1500 BC
(d) None of them

35. In which of the following B.Cs, Chinese have used iron?
(a) 2500 BC
(b) 250 BC
(c) 25 BC
(d) None of them

36. How much carbon is present in wrought iron?
(a) 2.5 – 4.5%
(b) 0.12 – 0.25%
(c) 0.25 – 2.5%
(d) None of them

37. What is the shape of PCl_5?
(a) Tetrahedral
(b) Square planer
(c) Octahedral
(d) Trigonal bipyramidal

38. How much carbon is present in Steel?
(a) 2.5 – 4.5%
(b) 0.12 – 0.25%
(c) 0.25 – 2.5%
(d) None of them

39. In wrought Iron ______ of impurities are present.
(a) 0.2%
(b) 0.3%
(c) 3%
(d) 0.03%

40. The formula of magnetite is
(a) Fe_3O_4
(b) Fe_2O_3
(c) $Fe_2O_3\ 3H_2O$
(d) None of them

41. When iron was produced in sub-continent?
(a) 2500 BC
(b) 1500 BC
(c) 600 BC
(d) None of them

42. What is the shape of $[CO(NH_3)_6]^{+3}$?
(a) Octahedral
(b) Square planer
(c) Tetrahedral
(d) None of them

43. The percentage of iron in cast iron is
(a) 0.12 – 2.5%
(b) 2.5 – 4.5%
(c) 0.25 – 2.5%
(d) None of them

44. In wrought Iron the %age of Mn is
(a) 0.2%
(b) 0.25%
(c) 0.3%
(d) None of them

45. What is the %age of P in wrought iron?
(a) 0.04 – 0.2%
(b) 0.25%
(c) 0.2 – 0.15%
(d) None of them

46. ______ forms slags in the manufacture of wrought iron from cast iron.
(a) Mn
(b) Si
(c) P
(d) All of them

47. **What is the %age of carbon in mild steel?**
(a) 0.1-0.2% (b) 0.1 - 0.3% (c) 1 - 2% (d) None of them

48. **Which of the following is harder than mild steel?**
(a) High carbon steel (b) Medium carbon steel
(c) Both a and b (d) None of them

49. **_____ is used in making rails, axels castings.**
(a) Mild steel (b) Medium carbon steel
(c) High carbon steel (d) All of them

50. **Steel containing more than _____ carbon cannot be forged.**
(a) 0.1% (b) 0.01% (c) 1.0% (d) None of them

51. **Lead chromate is _____ in water.**
(a) Soluble (b) Insoluble (c) Mixable (d) None of them

52. **$K_2Cr_4O_7$ is converted into $K_2Cr_2O_7$ when treated with**
(a) H_2SO_4 (b) KCl (c) K_2O (d) Both a and b

53. **What is the melting point of $K_2Cr_2O_7$?**
(a) 396°C (b) 369°C (c) 639°C (d) 936°C

54. **$K_2Cr_2O_7$ is _____ in water.**
(a) Soluble (b) Insoluble (c) Mixable (d) None of them

55. **Dichromates are very powerful**
(a) Reducing agent (b) Oxidizing agent (c) Both a and b (d) None of them

56. **What is the product of following reaction?**
$MnO_2 + 2KOH + KNO_3 \rightarrow KNO_2 + H_2O + ?$
(a) $KMnO_4$ (b) K_2MnO_4 (c) KMnO (d) None of them

57. **Which one of the following reaction involves Stadeler's process?**
(a) $2K_2MnO_4 + Cl_2 \rightarrow 2KCl + 2KMnO_4$
(b) $MnO_2 + 6KOH + KClO_3 \rightarrow 3K_2MnO_4 + KCl + 3H_2O$
(c) $2MnO_2 + 4KOH + O_2 \rightarrow 2K_2MnO_4 + 2H_2O$
(d) None of them

58. **By passing CO_2 through the green solution of K_2MnO_4 the color of solution becomes**
(a) Yellow (b) Blue (c) Purple (d) None of them

59. **The solubility of $KMnO_4$ in water at 20°C is**
(a) 5% (b) 0.7% (c) 7% (d) 70 %

60. **Potassium permanganate is a powerful**
(a) Reducing agent (b) Oxidizing agent
(c) Alloy (d) None of them

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ANSWERS

1.	d	2.	c	3.	a	4.	a	5.	b	6.	a	7.	b
8.	a	9.	c	10.	d	11.	d	12.	d	13.	b	14.	d
15.	a	16.	b	17.	b	18.	d	19.	a	20.	c	21.	a
22.	c	23.	b	24.	d	25.	a	26.	d	27.	a	28.	b
29.	c	30.	a	31.	c	32.	b	33.	a	34.	c	35.	a
36.	b	37.	d	38.	c	39.	b	40.	a	41.	c	42.	a
43.	b	44.	b	45.	a	46.	d	47.	a	48.	b	49.	b
50.	c	51.	b	52.	d	53.	a	54.	a	55.	b	56.	b
57.	a	58.	c	59.	c	60.	b						

FUNDAMENTAL PRINCIPLES OF ORGANIC CHEMISTRY & ETHANOL

SET – I

1. **The vital force theory was rejected by**
   (a) Frederick Wohler (b) Frederick Martin (c) Alferd Wohler (d) Alferd Martin
2. **The first organic compound synthesized in the laboratory by Frederick Wholer was**
   (a) Ethanol (b) Urea (c) Acetic acid (d) Formaldehyde
3. **Urea was synthesized in the laboratory from**
   (a) Ammonium chloride (b) Ammonium cyanate
   (c) Ammonium bicarbonate (d) Ammonia gas
4. **The ability of carbon atom to form bonds with other carbon atoms to produce long chains or rings is known as**
   (a) Cracking (b) Catenation (c) Carbonization (d) None of them
5. **Organic compounds are generally ______compounds.**
   (a) Covalent (b) Ionic
   (c) Co-ordinate covalent (d) All of them
6. **Choose the option which best describes the solubility of organic compounds:**
   (a) Insoluble in both water and organic non-polar solvents.
   (b) Soluble in both water and organic noon-polar solvents.
   (c) Soluble in water but in soluble in organic non-polar solvents.
   (d) Insoluble in water but soluble in organic non-polar solvents.
7. **Petroleum, coal and natural gas are also called**
   (a) Natural fuels (b) Fossil fuels (c) Hydrocarbon fuels (d) None of them
8. **Bituminous coal, inside the earth crust, under high pressure was converted to**
   (a) Lignite (b) Peat (c) Anthracite (d) Fertilizer
9. **About 80% of the coal in Pakistan is used**
   (a) To run power plants (b) To bake bricks in lime kilns
   (c) To run steam engines (d) None of them
10. **The major portion of natural gas consist of**
    (a) Ethane (b) Butane (c) Methane (d) Propane
11. **About ______ of the Coal in Pakistan is used to bake bricks in lime kilns.**
    (a) 10% (b) 50% (c) 18% (d) 80%
12. **Natural gas is a mixture of**
    (a) Low boiling hydrocarbons (b) Highly reactive hydrocarbons
    (c) Aromatic hydrocarbons (d) Substituted hydrocarbons

13. **Methane, present in natural gas, is formed by the**
    (a) Thermal cracking (b) Fractional distillation
    (c) Decomposition of organic matter (d) None of them
14. **Mineral oil, when it is in the refined form, is also called**
    (a) Natural oil (b) Crude oil (c) Petroleum (d) None of them
15. **Mineral oil extracted from rocks appears as a liquid of blackish colour known as**
    (a) Natural oil (b) Crude oil (c) Petroleum (d) None of them
16. **At present Pakistan has _____ oil refineries in operation.**
    (a) 4 (b) 8 (c) 2 (d) 6
17. **The boiling range of natural gas is**
    (a) Above 20 °C (b) Below 20 °C (c) 20-60 °C (d) None of them
18. **Petrol which is a fraction of petroleum has carbon atoms ranging in number from**
    (a) 5-10 (b) 5-6 (c) 12-18 (d) 20 and up
19. **Which one of the following is a fraction of petroleum?**
    (a) Natural gas (b) Ligroin (c) Asphalt (d) All of them
20. **Asphalt which is used to surface road and roofs is composed of**
    (a) Non-volatile liquids (b) Volatile liquids
    (c) Non volatile solids (d) All of them
21. **The fractional distillation of petroleum yields only about _____ gasoline.**
    (a) 2% (b) 20% (c) 62% (d) 30%
22. **Kerosene oil and gas oil can be converted into gasoline by a process called**
    (a) Cracking (b) Fractional distillation
    (c) Catenation (d) Hydrolysis
23. **Cracking is defined as**
    (a) Breaking of higher hydrocarbons having low boiling points into a variety of lower hydrocarbons also having low boiling points
    (b) Breaking of higher hydrocarbons having high boiling points into a variety of lower hydrocarbons having low boiling points.
    (c) Breaking of higher hydrocarbons having high boiling points into a variety of lower hydrocarbons having high boiling points.
    (d) All of them
24. **Cracking is generally carried out in the following ways**
    (a) Thermal cracking (b) Catalytic cracking
    (c) Steam cracking (d) All of them
25. **In thermal cracking breaking down of large molecules of hydrocarbons takes place by**
    (a) Heating at high temperature
    (b) Applying high pressure
    (c) Heating at low temperature in the presence of a catalyst
    (d) Heating at high temperature and pressure

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26. **A typical catalyst used for the process of catalytic cracking is**
(a) A mixture of silica and alumina
(b) A mixture of sodium and mercury
(c) A mixture of silica and mercury
(d) A mixture of silica and zinc

27. **Catalytic cracking produces gasoline of**
(a) Low octane number
(b) Higher octane number
(c) Intermediate octane number
(d) All of them

28. **The process of steam cracking is suitable for obtaining**
(a) Higher unsaturated hydrocarbons
(b) Lower unsaturated hydrocarbons
(c) Higher saturated hydrocarbons
(d) Lower saturated hydrocarbons

29. **Straight chain hydrocarbons have**
(a) High octane number and make poor fuels
(b) High octane number and make good fuels
(c) Low octane number and make good fuels
(d) Low octane number and make poor fuels

30. **______ burns very smoothly in an engine and has been arbitrarily given an octane number of 100.**
(a) 2-methyl propane
(b) 2,2,4, trimethyl pentane
(c) 2,2- dimethyl propane.
(d) n-butane

31. **Octane number of gasoline is improved by a process called**
(a) Catenation
(b) Reforming
(c) Fractional distillation
(d) None of them

32. **Reforming involves the conversion of**
(a) Straight chain hydrocarbons into branched chain
(b) Branched chain hydrocarbons into straight chain
(c) Straight chain hydrocarbons into cyclic hydrocarbons
(d) All of them

33. **Reforming involves the conversion of straight chain hydrocarbons into branched chain by heat**
(a) In the absence of oxygen and in the presence of a catalyst
(b) In the presence of oxygen and in the absence of a catalyst
(c) In the presence of both oxygen and catalyst
(d) All of them

34. **The octane number of poor fuel can be improved by**
(a) Reforming
(b) Adding tetraethyl lead
(c) Both a and b
(d) None of them

35. **The combustion product of tetraethyl lead responsible for air pollution is**
(a) Metallic lead
(b) Lead oxide
(c) Lead sulphide
(d) None of them

36. **The chains in acidic hydrocarbons may be**
(a) Branched only
(b) Non-branched only
(c) Branched or non-branched
(d) None of them

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37. **In homocyclic compounds the ring consists of**
(a) Carbon and oxygen atoms (b) Carbon and nitrogen atoms
(c) Only carbon atoms (d) All of them

38. **Alicyclic compounds are the homocyclic compounds which contain a ring of**
(a) 5 or more carbon atoms (b) 6 or more carbon atoms
(c) 3 or more carbon atoms (d) None of them

39. **The saturated alicyclic hydrocarbons have the general formula**
(a) $Cn\ H_{2n+2}$ (b) $Cn\ H_{2n-1}$ (c) CnH_{2n} (d) CnH_{3n}

40. **Which one of the following is not an alicyclic compound?**
(a) Cyclohexene (b) Cyclohexane (c) Benzene (d) Cyclopentane

41. **Which one of the following is an aromatic compound?**
(a) Benzene (b) Phenol (c) Toluene (d) All of them

42. **Furan is a ______compound.**
(a) Acyclic (b) Alicyclic (c) Heterocyclic (d) None of them

43. **The four sp^3 hybrid orbitals in carbon are directed at an angle of**
(a) 120° (b) 107.28° (c) 109.28° (d) 90°

44. **The four sp^3 hybrid orbitals are arranged in space to give a _______ geometry.**
(a) Trigonal (b) Tetrahedral (c) Linear (d) None of them

45. **The bond angle between any tow Sp^2 hybrid orbitals is**
(a) 109.28° (b) 107.09° (c) 120° (d) 90°

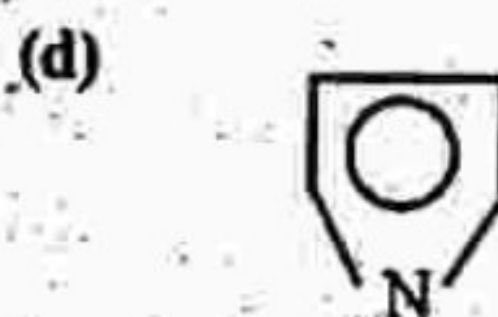
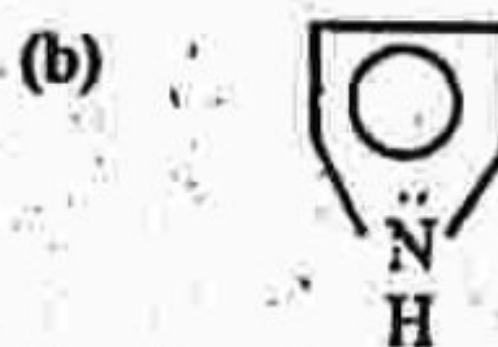
46. **The sp^2 hybrid orbitals are arranged in space to give _______ geometry.**
(a) Tetrahedral (b) Linear (c) Trigonal (d) None of them

47. **In sp hybridization the angle between the two hybrid orbitals is**
(a) 180° (b) 120° (c) 90° (d) 109.28°

48. **The shortening of bond distance between two carbons in ethyne is due to the**
(a) Presence of a σ bond. (b) Presence of two π-bonds
(c) Presence of a σ and two π-bonds (d) None of them

49. **Which one of the following is the structure of thiophene?**
(a) [ring structure with Ö] (b) [ring structure with N–H]
(c) [ring structure with S̈] (d) None of them

50. **Which one of the following is the structure of Furan?**

(a) [five-membered ring with Ö] (b) [five-membered ring with N–H] (c) [five-membered ring with S] (d) [ring with N]

51. **In isomerism two compounds have the**
   (a) Different molecular formula but same structural formulas.
   (b) Same molecular formula but different structural formulas.
   (c) Same molecular and structural formulas.
   (d) Different molecular and structural formulas.
52. **Which one of the following does not show isomerism?**
   (a) Propane (b) Butane (c) Hexane (d) Pentane
53. **Which one of the following shows isomerism?**
   (a) Methane (b) Propane (c) Butane (d) All of them
54. **Butane has ______ isomeric forms.**
   (a) 3 (b) 2 (c) 4 (d) 1
55. **The structural isomerism arises due to the difference in the**
   (a) Number of atoms in the molecule (b) Arrangements of atoms in the molecule
   (c) Number as well as arrangement of atoms in the molecule.
   (d) None of them
56. **The isomerism arising due to the difference in the nature of carbon chain is**
   (a) Position isomerism (b) Chain isomerism
   (c) Functional group isomerism (d) Metamerism
57. **Position isomerism arises due to the difference in the**
   (a) Functional group (b) Position of the functional group
   (c) Distribution of carbon atoms on either side of functional groups
   (d) None of them
58. **Functional group isomerism arises due to the difference in the**
   (a) Position of the functional group (b) Nature of the carbon chain
   (c) Functional groups (d) None of them
59. **Isomerism arising due to the unequal distribution of carbon atoms on either side of the functional group is known as**
   (a) Geometric isomerism (b) Metamerism
   (c) Position isomerism (d) Chain isomerism

60. To carbon atoms joined by a double bond
(a) Can rotate freely (b) Cannot rotate freely
(c) Sometimes rotate freely (d) None of them
61. Two carbon atoms joined by a single bond
(a) Sometimes rotate freely (b) Cannot rotate freely
(c) Can rotate freely (d) All of them
62. Such compounds which possess the same structural formula but differ with respect to the positions of the identical groups in space are called
(a) Position isomers (b) Metamerism
(c) Functional group isomerism (d) Cir-trans isomers
63. The rotation of two carbon atoms joined by a double bond could happen only if
(a) The pi bond breaks (b) Both pi and sigma bonds break
(c) Sigma bond breaks (d) None of them
64. The reactions involving organic compounds are
(a) Fast and yields are low. (b) Slow and yields are low.
(c) Slow and yields are high. (d) Fast and yields are high.
65. Which one of the following is an aromatic compound?
(a) Cyclohexene (b) Cyclohexane (c) Cyclopentane (d) None of them
66. Mercapto group is present in
(a) Ether (b) Thiol (c) Ester (d) Acid amide
67. Diethyl ether and methyl propyl ether are
(a) Chain Isomers (b) Position isomers
(c) Metamers (d) Functional group isomers
68. 1-Chloropropane and 2-Chloropropane are
(a) Chain isomers (b) Functional group isomers
(c) Metamers (d) Position isomers
69. When coal is heated in the absence of air, it is converted into
(a) Coal gas (b) Coke (c) Coal tar (d) All of them
70. Which one of the following solvents is unlikely to dissolve an organic compound?
(a) Water (b) Benzene (c) Chloroform (d) Ether
71. Choose the correct formula of starch:
(a) $(C_5H_{10}O_5)_n$ (b) $(C_6H_{10}O_5)_n$ (c) $(C_6H_{11}O_5)_n$ (d) $(C_6H_{12}O_5)_n$
72. Choose the correct statement:
(a) Divalent carbon atom is more stable than tetravalent carbon atom.
(b) Tetravalent carbon atom is more stable than divalent carbon atom.
(c) Both are equally stable. (d) Both are equally unstable.
73. Pentane has ______ isomers.
(a) 3 (b) 2 (c) 5 (d) 9

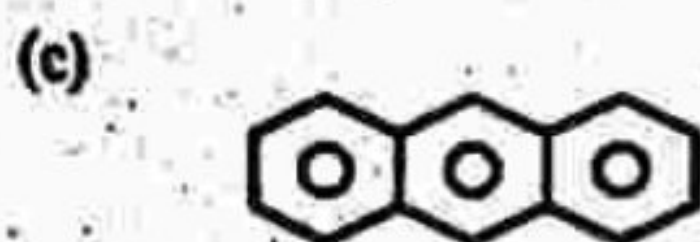
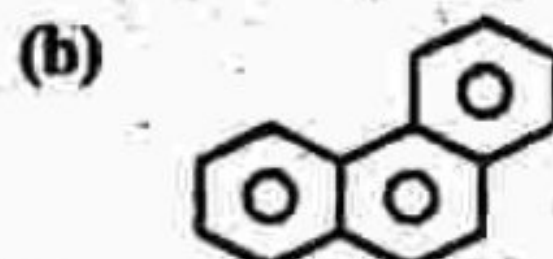
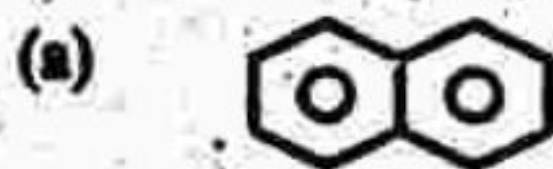
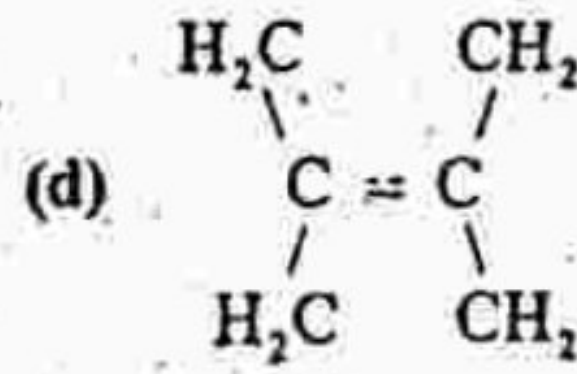
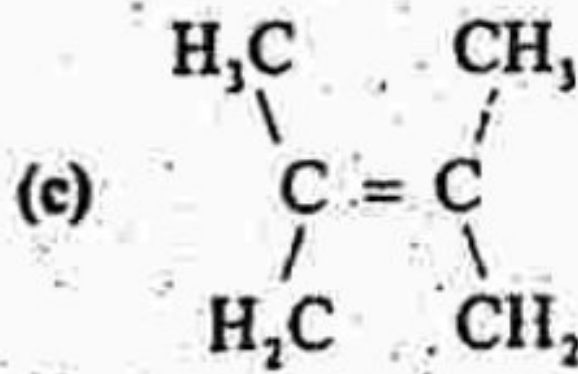
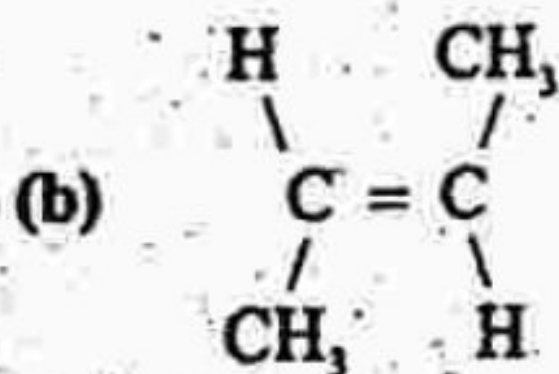
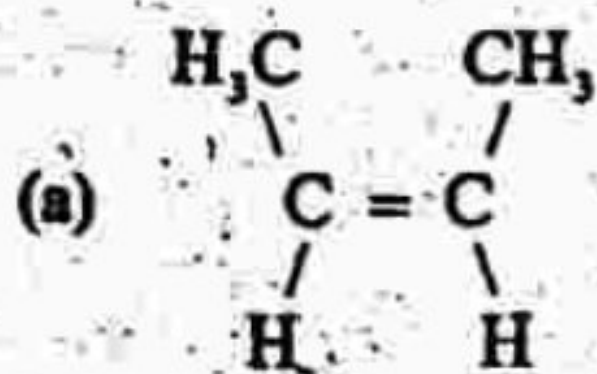
74. **Two carbon atoms joined by a ________ bond are capable of free rotation.**
(a) Double (b) Triple (c) Single (d) None of them

75. **The necessary condition for a compound to exhibit geometric isomerism is that the two groups attached to**
(a) Same carbon atom must be similar
(b) Same carbon atom must be different.
(c) Different carbon atoms must be same
(d) Different carbon atoms must be different.

76. **An aldehyde contains ________ as a functional group.**
(a) Carbonyl group (b) Formyl group (c) Hydroxyl group (d) None of them

77. **Cyano group is present in**
(a) Alkane nitriles (b) Nitro compounds (c) Thiol compounds (d) None of them

78. **Thermal cracking is useful in the production of**
(a) Saturated hydrocarbons
(b) Branched chain hydrocarbons
(c) Unsaturated hydrocarbons
(d) None of them

79. **Which of the following is the structure of anthracene?**
(a)
(b)
(c)
(d) None of them

80. **The structural formula of CIS, 2-Butene is**
(a) $H_3C(H)C=C(H)CH_3$ (H_3C and CH_3 on the same side; H and H below)
(b) $H(CH_3)C=C(H)CH_3$ (H and CH_3 above; CH_3 and H below)
(c) $H_3C(H_2C)C=C(CH_2)CH_3$ (H_3C, CH_3 above; H_2C, CH_2 below)
(d) $H_2C(H_2C)C=C(CH_2)CH_2$ (H_2C, CH_2 above; H_2C, CH_2 below)

ANSWERS

1.	a	2.	b	3.	b	4.	b	5.	a	6.	d	7.	b
8.	c	9.	b	10.	c	11.	d	12.	a	13.	c	14.	c
15.	b	16.	a	17.	b	18.	a	19.	d	20.	c	21.	b
22.	a	23.	b	24.	d	25.	d	26.	a	27.	b	28.	b
29.	d	30.	b	31.	b	32.	a	33.	a	34.	c	35.	a
36.	c	37.	c	38.	c	39.	c	40.	c	41.	d	42.	b
43.	c	44.	b	45.	c	46.	c	47.	a	48.	c	49.	c
50.	a	51.	b	52.	a	53.	c	54.	b	55.	b	56.	b
57.	b	58.	c	59.	b	60.	b	61.	c	62.	d	63.	a
64.	b	65.	d	66.	b	67.	c	68.	d	69.	d	70.	a
71.	b	72.	b	73.	a	74.	c	75.	b	76.	b	77.	a
78.	c	79.	c	80.	a								

SET – II

1. **CFC stands for**
   (a) Chloroflourocarbons
   (b) Cycloflourochlorine
   (c) Chloroflouro Carbides
   (d) None of these
2. **Plastic sulphur and monoclinic sulphur are the _________ of sulphur.**
   (a) Opposite forms (b) Positive forms (c) Allotropic form (d) None of these
3. **_________ is the other name for anisole.**
   (a) Methoxy benzene (b) Chlorobenzene (c) Butanoic acid (d) Hydrochloric acid
4. **_________ reacts with alkene in presence of H_2O_2 to give alkyl halide?**
   (a) Hydrochloric acid (b) Hydrobromic acid (c) Sulphuric acid (d) Hydrogen iodide
5. **_________ is known as a father of chemistry.**
   (a) Jabir Ibn Hayyan (b) Paul Ehrlich (c) Manfred Eigen (d) Fausto Elhuyar
6. **_______ first demonstrated that vital force is not essential for organic compounds.**
   (a) Rutherford
   (b) Friedrich Wohler
   (c) Richard R. Ernst
   (d) Conrad Arnold Elvehjem
7. **The benzene ring is _________-due to conjugation.**
   (a) Stable (b) Unstable (c) Long (d) Small
8. **The chemical formula for ethanol is _________**
   (a) C_2H_5OH (b) C_2H_6OH (c) C_3H_8OH (d) None of the above
9. **_________ is another name for ethanol.**
   (a) Grain alcohol (b) Ethyl alcohol (c) Methyl alcohol (d) None of these
10. **The melting point of ethanol is_________.**
    (a) 100 °C (b) 101 °C (c) 102°C (d) -114.3 °C

ANSWERS

1.	a	2.	c	3.	a	4.	b	5.	a	6.	b	7.	a
8.	a	9.	b	10.	d								

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HYDROCARBONS, ALKYL HALIDES & GLOBAL WARMING

SET – I

1. Alkanes can be considered ________.
   (a) Saturated (b) Unsaturated. (c) Normal (d) Acidic
2. ________ gas is NOT formed by the combustion of hydrocarbons.
   (a) Oxygen (b) Nitrogen (c) Carbon dioxide (d) Ammonia
3. A compound made from hydrogen and carbon only is called ________
   (a) Building block (b) Hydrocarbon (c) Mixture (d) None of these
4. Small hydrocarbons are more ________ than large hydrocarbons.
   (a) Viscous (b) Flammable (c) Volatile (d) Combustible
5. Alkane consists of ________.
   (a) No bond (b) Single bond (c) Double bond (d) None of these
6. Alkene consists of ________.
   (a) Triple bond (b) Double bond (c) Single bond (d) None of these
7. The alkene, with four carbon atoms, is called
   (a) Ethane (b) Butane (c) Methane (d) Propene
8. Alkenes can be used to make ________
   (a) Polymers (b) Fire extinguishers (c) Aeroplanes (d) None of these
9. Alkenes can be distinguished from alkanes by using ________ water.
   (a) Hard (b) Soft (c) Normal (d) None of these
10. Alkyne consists of ________.
    (a) Triple bond (b) Double bond (c) Single bond (d) None of these
11. For the top of an oil fractionating column, which statement is true?
    (a) It is colder than apparatus (b) It is colder than the bottom of the column
    (c) It is hotter than the bottom of the column (d) None of these
12. What takes place to a liquid during its separation from a mixture by distillation?
    (a) Only condensing (b) Evaporation pursued by condensing
    (c) Evaporation followed by oxidisation (d) None of these
13. ________ gas is mostly responsible for acid rain.
    (a) Sulphuric acid (b) Sulphur monoxide (c) Sulphur dioxide (d) None of these
14. ________ is caused by the discharge of carbon dioxide into the atmosphere.
    (a) Change of weather (b) Global warming
    (c) Spoil of air oxygen (d) Spoil of water in soil

ANSWERS

1.	a	2.	a	3.	b	4.	c	5.	b	6.	b	7.	d
8.	a	9.	c	10.	a	11.	b	12.	b	13.	c	14.	b

SET - II

1. $H - \overset{H}{\underset{H}{C}} - X$ **is the formula for**
   (a) Monohaloalkane (b) Dihaloalkane (c) Trihaloalkane (d) None of them
2. **______ are also called alkyl halides.**
   (a) Monohaloalkanes (b) Dihaloalkanes (c) Trihaloalkanes (d) None of them
3. **Alkyl halides are further classified into _____ alkyl halides.**
   (a) Primary (b) Secondary (c) Tertiary (d) All of the above
4. **$CH_3 - CH_2 - CH_2 - C\ell$ is the formula of.**
   (a) Methyl chloride (b) Ethyl Chloride (c) N-propyl chloride (d) Propane
5. **In tertiary halides, hydrogen atom is attached to a carbon which is further attached to _____ carbon atoms directly.**
   (a) One (b) Two (c) Three (d) Four
6. **IUPAC name of $CH_3 - CH_2 - CH_2 - C\ell$ is**
   (a) 1-chloropropane (b) Chloropropane (c) Propane chloride (d) None of them
7. **IUPAC name of $H - \overset{C\ell}{\underset{C\ell}{C}} - C\ell$ is**
   (a) Chloromethane (b) Methane chloride (c) Trichloromethane (d) None of them
8. **IUPAC name of $CH_3 - \overset{CH_3}{\underset{CH_3}{C}} - C\ell$ is .**
   (a) 2-chloro-methyl propane (b) 2-Chloro-2-methyl propane
   (c) Chloro-methyl -propane (d) None of them
9. **The best method for the preparation of alkyl halides is from**
   (a) Alkanes (b) Alkenes (c) Alkynes (d) Alcohols
10. **$CH_3CH_2 - OH +$ ______ $\rightarrow CH_3CH_2 - X + H_2O$**
    (a) X (b) H (c) HX (d) HOX

11. Alcohols react with thionyl chloride in ______ as a solvent to give alkyl chlorides.
(a) Ether (b) Water (c) Pyridine (d) Naphthalene

12. Phosphorus trihalides or phosphorus pentahalides react with alcohols to replace ______ group by a halo group.
(a) –OH (b) –COOH (c) $-NO_2$ (d) $-SO_3H$

13. An excellent method for the preparation of simple alkyl iodide is the treatment of alkyl chloride or alkyl bromide with ______ iodide.
(a) Potassium (b) Calcium (c) Sodium (d) None of them

14. Bond energy of C-F bond is ______ Kj / mole.
(a) 467 (b) 413 (c) 346 (d) 299

15. ______ bond has the least bond energy than other C–X bonds.
(a) C – F (b) C–Cℓ (c) C–Br (d) C–I

16. The order of reactivity of alkyl halides is
(a) R–I> R–Br> R–Cℓ>R–F
(b) R–F>R–Cℓ>R–Br>R–I
(c) R–F>R–Br>R–Cℓ>R–I
(d) None of them

17. Electro negativity of bromine atom is
(a) 4.0 (b) 3.0 (c) 2.8 (d) 2.5

18. Alkyl ______ do not react under ordinary conditions.
(a) Chlorides (b) Bromides (c) Iodides (d) Fluorides

19. The reactions of alkyl halides fall into ______ categories.
(a) Two (b) Three (c) Four (d) Five

20. A specie which attracts electrons (electron loving) is called
(a) Electrophile (b) Leaving group (c) Substrate (d) None of them

21. An electrophile is
(a) Neutral
(b) Positively charged
(c) Negatively charged
(d) Both a and b

22. The alkyl halide molecule on which a nucleophile attacks is called a ______ molecule.
(a) Electrophile (b) Substrate (c) Free (d) None of them

23. Alkyl halides may undergo nucleophilic substitution reactions in ______ different days.
(a) Two (b) Three (c) Four (d) Five

24. Among the alkyl halides the primary alkyl halides always follow ______ mechanism.
(a) S_{N1} (b) S_{N2} (c) S_{N3} (d) S_{N4}

25. In S_{N1} mechanism ______ molecule takes part in rate determining step.
(a) Only One (b) Two (c) Three (d) Four

26. ______ alkyl halides when attacked by a nucleophile always follows S_{N1} mechanism.
(a) Primary (b) Secondary (c) Tertiary (d) Cyclic

27. ______ alkyl halides follow both S_{N1} and S_{N2} mechanisms.
(a) Primary (b) Secondary (c) Tertiary (d) Cyclic

28. **The rate equation of S_{N1} reactions can be written as follows: rate =**
(a) [Alkyl halide] (b) K[Alkyl halide] (c) K[Nucleophile] (d) K[Alkyl halide]

29. **In Wurtz synthesis, alkyl halides react with sodium in_____ solvent to give alkanes.**
(a) Pyridine (b) Water (c) Alcohal (d) Ether

30. CH_3–CH_2–CH_2–$C\ell$ + ____ $\xrightarrow{Zn/HCl}$ CH_3–CH_2–CH_3+$HC\ell$
(a) H_2 (b) $HC\ell$ (c) [H] (d) 2[H]

31. **The formula for sodium lead alloy is**
(a) NaPb (b) $NaPb_4$ (c) Na_2Pb (d) Na_4Pb

32. **Grignard reagent was first prepared by Victor Grignard in**
(a) 1800 (b) 1850 (c) 1900 (d) 1950

33. **Grignard reagents are prepared by the reaction of _____ metal with alkyl halides in the presence of dry ether.**
(a) Sodium (b) Magnesium (c) Silver (d) Zinc

34. **Reactivity of alkyl halides with magnesium is in the following order**
(a) Alkyl iodide>Alkyl bromide> Alkyl chloride
(b) Alkyl bromide > alkyl chloride > alkyl iodide
(c) Alkyl chloride > Alkyl iodide > Alkyl bromide
(d) None of them

35. **Mostly reactions shown by Grignard reagent are**
(a) Endothermic (b) Exothermic (c) Slow (d) Fast

36. **The general formula for alkyl halides is**
(a) $C_nH_{2n}X$ (b) $C_nH_{2N+1}X$ (c) C_nH_nX (d) $C_nH_{2n+2}X$

37. **Ethyl magnesium bromide reacts with water to give**
(a) Methane (b) Ethane (c) Propane (d) Butane

38. **For which mechanisms, the first step involved is the same**
(a) E_1 and E_2 (b) E_2 and S_{n2} (c) E_1 and S_{n1} (d) E_1 and S_{n2}

39. **When CO_2 is made to react with ethyl magnesium iodide followed by acid hydrolysis, the product formed is**
(a) Propane (b) Propanoic acid (c) Proponal (d) Propanol

40. **Grignard regent is reactive due to**
(a) The presence of halogen atom (b) The presence of Mg atom
(c) The polarity of C–Mg bond (d) None of them

41. **The formula of ethyl thioalcohol is**
(a) C_2H_5OH (b) $C_2H_5SO_4$ (c) C_2H_5SH (d) $C_2H_5SH_4$

42. **_____ has a reactive nucleophilic carbon atom which can react with electrophilic centres to give products in high yields.**
(a) Grignard reagent (b) Alkyl halides (c) Ethylene epoxide (d) None of them

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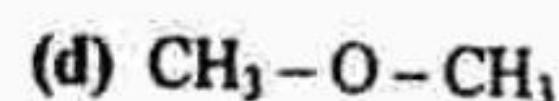
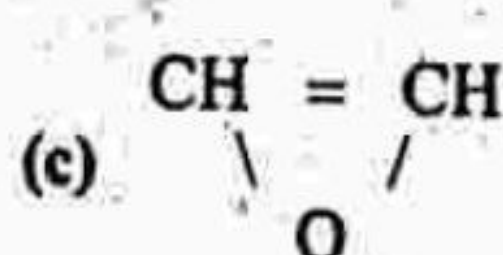
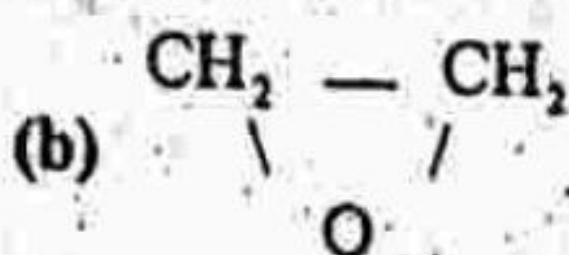
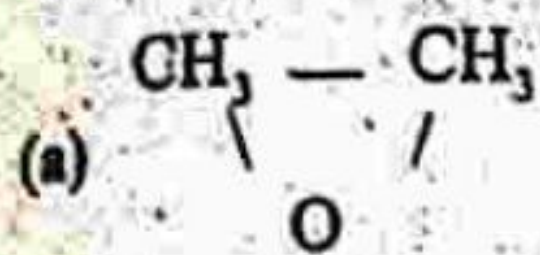
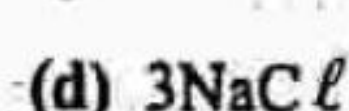
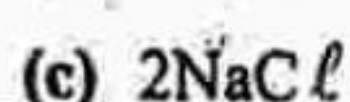
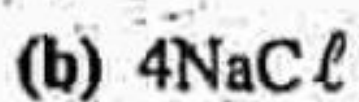
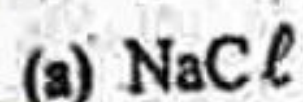
43. **The formula of ethylene epoxide is**

(a) $CH_3 - CH_3$ with O bridging (\ O /)
(b) $CH_2 - CH_2$ with O bridging (\ O /)
(c) $CH = CH$ with O bridging (\ O /)
(d) $CH_3 - O - CH_3$

44. $4CH_3Cl + Na_4Pb \rightarrow (CH_3)_4Pb +$

(a) NaCℓ (b) 4NaCℓ (c) 2NaCℓ (d) 3NaCℓ

45. **Electronegativity of carbon is**

(a) 4.0 (b) 3.0 (c) 2.1 (d) 2.5

46. **Electronegativity of chlorine is**

(a) 4.0 (b) 3.0 (c) 2.8 (d) 2.5

47. **Electronegativity of Bromine is**

(a) 4.0 (b) 3.0 (c) 2.8 (d) 2.5

48. **Electronegativity of Iodine is**

(a) 4.0 (b) 3.0 (c) 2.8 (d) 2.5

49. **Electronegativity of hydrogen is**

(a) 3.0 (b) 2.8 (c) 2.5 (d) 2.1

50. **Experiments have shown that the strength of ______ bond is the main factor which decides the reactivity of alkyl halides.**

(a) Carbon carbon (b) Carbon hydrogen (c) Carbon halogen (d) Hydrogen halogen

ANSWERS

1.	a	2.	a	3.	d	4.	c	5.	c	6.	a	7.	c
8.	b	9.	d	10.	c	11.	c	12.	a	13.	c	14.	a
15.	d	16.	a	17.	c	18.	d	19.	a	20.	a	21.	d
22.	b	23.	a	24.	b	25.	a	26.	c	27.	b	28.	d
29.	d	30.	c	31.	d	32.	c	33.	b	34.	a	35.	b
36.	b	37.	b	38.	c	39.	d	40.	c	41.	c	42.	a
43.	b	44.	b	45.	d	46.	b	47.	c	48.	d	49.	d
50.	c												

ALCOHOLS, PHENOLS, ETHERS, CARBOXYLIC ACIDS, ESTERS & FERMENTATION

SET-I

1. **The alcohol having two carbon atoms is ________.**
   (a) Propane (b) Methane (c) Ethane (d) Ethanol
2. **________ isomers are there of butanol.**
   (a) 11 (b) 22 (c) 33 (d) 4
3. **The functional group for carboxylic acids is represented as ________.**
   (a) COH (b) COOOH (c) COOH (d) none of these
4. **________ is formed by reacting ethanoic acid with methanol.**
   (a) Methyl ethanoate (b) Ethyl ethanoate (c) Propane (d) None of these
5. **________ is found in vinegar.**
   (a) Ethanoic acid (b) Methanoic acid (c) Butanoic acid (d) Citric acid
6. **When ethanol makes steam by reaction of ethene, the catalyst for this reaction is**
   (a) Ethyl alcohol (b) Magnesium dioxide
   (c) Phosphoric acid (d) None of these
7. **A mixture of alcohol and water can be estranged by the process of ________.**
   (a) Filtration (b) Thermal decay
   (c) Fractional distillation (d) none of these
8. **Alcohol is manufactured on large scale by ________.**
   (a) Hydration of ethane (b) Hydration of methane
   (c) Hydration of propane (d) Hydration of butane
9. **________ is a sweet smelling compound**
   (a) Blue compound (b) Tartaric acid (c) Ester (d) None of these
10. **Contravention chemical bonds are seen in ________.**
    (a) An endothermic process (b) A negative exothermic process
    (c) A process without power (d) A process without temperature
11. **In an exothermic reaction, energy is**
    (a) Exploit (b) Released (c) Positive charged (d) Negative charge
12. **The change in energy is ________ in an endothermic reaction.**
    (a) Same (b) Positive (c) Zero (d) Endless
13. **The fermentation equation is expression for ________.**
    (a) Carbon dioxide > alcohol (b) Water - yeast > carbon dioxide
    (c) Yeast + glucose > carbon dioxide + alcohol (d) None of these

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14. **Anaerobic respiration means**
(a) With gulp of air
(b) Without gulp of air
(c) With oxygen
(d) Without oxygen

ANSWERS

1.	d	2.	d	3.	c	4.	a	5.	a	6.	c	7.	c
8.	a	9.	c	10.	a	11.	b	12.	b	13.	c	14.	d

SET – II

1. **The general formula for alcohols is**
(a) RH (b) ROH (c) ROOH (d) RCOOH

2. CH_3 \ CH - OH / CH_3 **is the example of**
(a) Primary alcohol (b) Secondary alcohol (c) Tertiary alcohol (d) None of them

3. **There are ______ systems of naming alcohols**
(a) Two (b) Three (c) Four (d) Five

4. **The formula of benzyl alcohol is**
(a) C_6H_5OH (b) $C_6H_5C_2H_4OH$ (c) $C_6H_5CH_2OH$ (d) C_6H_5COOH

5. **In IUPAC system** $\underset{OH}{CH_2}-\underset{OH}{CH_2}$ **is named as**
(a) 1,2–Ethanol (b) Ethanediol (c) 1,2–Ethanediol (d) Diethanol

6. **Mathanol is also called as ______ spirit.**
(a) Leaf (b) Root (c) Wood (d) Flower

7. $______ + 2H_2 \xrightarrow[450°C : 200\ atm]{ZnO + Cr_2O_3} CH_3OH$
(a) CO_2 (b) CO (c) H_2O (d) None of them

8. **Ethanol is prepared on industrial scale world over, by the process of**
(a) Fermentation (b) Alkylation (c) Acylation (d) Hydration

9. **Fermentation is a ________ process.**
(a) Physical (b) Chemical (c) Bio–chemical (d) None of them

10. **In Pakistan, ethanol is prepared by the fermentation of**
(a) Molasses (b) Starch grains (c) Fruit juices (d) All of them

11. **The residue obtained after the crystallization of sugar from concentrated sugarcane juice is called**
(a) Enzyme (b) Starch (c) Diastase (d) Molasses

12. Molasses undergo fermentation in the presence of enzymes present in yeast to give
(a) Methanol (b) Ethanol (c) Propanol (d) Butanol

13. Alcohol obtained by fermentation is only upto 12% and never exceeds _____ because beyond this limit enzymes become inactive.
(a) 13% (b) 14% (c) 15% (d) 16%

14. Absolute alcohol can be obtained by re-distillation of rectified spirit in the presence of _______ which absorbs its moisture.
(a) $Ca(OH)_2$ (b) CaO (c) CO_2 (d) CO

15. Sometimes ethanol is denatured by addition of _____ % methanol to avoid its use for drinking purpose.
(a) 8 (b) 9 (c) 10 (d) 11

16. Alcohols can be obtained by the ______ of alkenes.
(a) Hydrogenation (b) Hydration (c) Halogenation (d) None of them

17. Alcohol reacts with other reagents in _____ ways.
(a) Two (b) Three (c) Four (d) Five

18. The order of reactivity of alcoholos when C–O bonds break:
(a) Tertiary Alcohol > Primary Alcohol
(b) Tertiary Alcohol > Secondary Alcohol
(c) Tertiary Alcohol > Secondary Alcohol > Primary Alcohol
(d) None of them

19. $C_2H_5OH + HC\ell \xrightarrow{ZnCl_2}$ _____ $+ H_2O$
(a) $C_2H_5C\ell$ (b) C_2H_5OH (c) C_2H_6 (d) $HC\ell$

20. Oxidation of alcohols covert them into
(a) Aldehyde (b) Ketones (c) Acids (d) Both a and b

21. The best reagent for the oxidation of alcohols is
(a) $ZnC\ell_2$ (b) Ether (c) Acid dichromate (d) Pyridine

22. _____ alcohols are resistant to oxidation.
(a) Primary (b) Secondary (c) Tertiary (d) Long chain

23. $C_2H_5OH \xrightarrow[180^\circ C]{Conc.\ H_2SO_4}$ _______ $+ H_2O$
(a) CH_3-CH_3 (b) $CH \equiv CH$ (c) $CH_2=CH_2$ (d) None of them

24. _______ gives idoform with iodine in the presence of NaOH.
(a) Methanol (b) Ethanol (c) Propanol (d) Butanol

25. The formula of carbolic acid is
(a) C_6H_5OH (b) C_2H_5OH (c) CH_3OH (d) C_3H_7OH

26. Phenol was first obtained from coaltar by ______ in 1834.
(a) Grignard (b) Dow (c) Runge (d) Lucas

27. The melting point of phenol is ____ °C.
(a) 39 (b) 40 (c) 41 (d) 42

28. The boiling point of phenol is ______ °C
(a) 172 (b) 182 (c) 192 (d) 200

29. Phenol is completely soluble in water above ______ °C
(a) 66.5 (b) 68.5 (c) 70.5 (d) 72.5

30. Phenol shows ______ types of reactions.
(a) Two (b) Three (c) Four (d) Five

31. The dissociation constant (Ka) of phenol is
(a) 1.3×10^{10} (b) 1.3×10^{-10} (c) 3×10^{10} (d) 3×10^{-10}

32. Phenol reacts with alkalies to form
(a) Acids (b) Bases (c) Water (d) Salts

33. Phenol reacts with acetyl chloride in the presence of a base to form
(a) Acid (b) Alkane (c) Aldehyde (d) Ester

34. Phenol reacts with conc. ______ at room temperature giving ortho and para benzene sulphonic acids
(a) $HC\ell$ (b) H_2SO_4 (c) HNO_3 (d) None of them

35. Aqueous solution of phenol reacts with bromine water to give ______ precipitate of 2, 4, 6 tribromophenol.
(a) White (b) Yellow (c) Blue (d) Green

36. When hydrogen is passed through phenol at ______ °C in the presence of Ni catalyst it gives cyclohexanol.
(a) 110 (b) 120 (c) 140 (d) 150

37. The IUPAC name of $CH_3OC_6H_5$ is
(a) Methoxy methane (b) Methoxy ethane (c) Ethoxy propane (d) Methoxy benzene

38. Ethers are prepared from ____ either directly or indirectly.
(a) Alkanes (b) Alkenes (c) Alcohols (d) Acids

39. Alcohals are reacted with metallic ______ to form alkoxides
(a) Magnesium (b) Sodium (c) Potassium (d) None of them

40. $2C_2H_5Br +$ ______ $\rightarrow C_2H_5OC_2H_5 + 2AgBr$
(a) AgO (b) Ag_2O (c) 2Ag (d) Ag

41. $C_2H_5-O-C_2H_5 +$ ______ $\rightarrow 2C_2H_5C\ell + POC\ell_3$
(a) $PC\ell_3$ (b) $PC\ell_5$ (c) $C\ell_2$ (d) $2PC\ell_3$

42. Primary, secondary and tertiary alcohols can be distinguished by ______ test.
(a) Grignard (b) Dow (c) Perry (d) Lucas

43. The IUPAC name of
$$\begin{array}{cc} CH_2 - & CH_2 \\ | & | \\ OH & OH \end{array}$$
(a) 1, 2 ethanol (b) 1, 2 Ethanediol (c) Diethanol (d) None of them

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44. **The IUPAC name of** $CH_3 - CH_2 - CH(OH) - CH_3$

(a) Butanol (b) 2–Butanol (c) 3–Butanol (d) Butane alcohol

45. **The formula for 1, 2, 3–Propanetriol is**

(a) $CH_2(OH) - CH(OH) - CH_2(OH)$

(b) $CH_3(OH) - CH_3(OH) - CH_3(OH)$

(c) $C(OH) - C(OH) - C(OH)$

(d) $CH_3(OH) - CH_2(OH) - CH_3(OH)$

46. **The common name of** $(CH_3)_2CH-OH$ **is**

(a) Propyl alcohol (b) ISO–propyl alcohol

(c) Propanol (d) ISO – propanol

47. **The common name of** $(CH_3)_3C-OH$ **is**

(a) n–Butyl alcohol (b) iso – Butyl alcohol (c) sec–butyl alcohol (d) ter–butyl alcohol

48. **The optimum temperature for the process of fermentation in the preparation of ethanol is**

(a) 10–15°C (b) 25–30°C (c) 25–50°C (d) 25–100°C

49. **The formula of methoxy benzene is**

(a) $CH_3OC_6H_5$ (b) $CH_2OC_6H_5$ (c) $CH_4OC_6H_6$ (d) $CH_3OHC_6H_5$

50. **Ethers are classified into ______ categories.**

(a) Two (b) Three (c) Four (d) Five

ANSWERS

1.	b	2.	b	3.	a	4.	c	5.	c	6.	c	7.	b
8.	a	9.	c	10.	d	11.	d	12.	b	13.	b	14.	b
15.	c	16.	b	17.	a	18.	c	19.	a	20.	d	21.	c
22.	c	23.	c	24.	b	25.	a	26.	c	27.	c	28.	b
29.	b	30.	a	31.	b	32.	d	33.	d	34.	b	35.	a
36.	d	37.	d	38.	c	39.	b	40.	b	41.	b	42.	d
43.	d	44.	b	45.	a	46.	b	47.	d	48.	b	49.	a
50.	a												

ANSWERS

1	b	2	a	3	b	4	c	5	d	6	b	7	c
8	b	9	a	10	b	11	d	12	c	13	b	14	c
15	c	16	b	17	a	18	a	19	c	20	b	21	d
22	b	23	c	24	c	25	c	26	b	27	b	28	d
29	a	30	b	31	a	32	d	33	c	34	d	35	a
36	a	37	c	38	c	39	a	40	c	41	b	42	a
43	b	44	b	45	d	46	b	47	c	48	a	49	d
50	c												

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CATALYSTS, ENZYMES, FOSSIL FUELS & CRUDE OILS

1. A catalyst is NOT consumed during in a
(a) Fast reaction (b) Chemical change (c) Equation (d) Reaction

2. A catalyst will _______ the rate of a reaction.
(a) Slower (b) Increase (c) Faster (d) none of these

3. A catalyst is usually a/an _________.
(a) Transition metal (b) Ionic compound halogen
(c) Ionic molecule (d) None of these

4. A catalyst decreases the activation energy for a
(a) Heat reaction (b) Reaction (c) Molecule (d) None of these

5. An enzyme is a _________.
(a) Ionic compound (b) Covlant substance (c) Biological catalyst (d) none of these

6. The enzyme that converts glucose into fructose is called _________.
(a) Isomerase (b) Butane (c) Pantane (d) Ethyl halide

7. If an enzyme gets also hot it will
(a) Imitate (b) Mixture black ball (c) Denature (d) None of these

8. Fossil fuels are non-renewable and ________.
(a) Infinite (b) Finite (c) Good conductor (d) None of these

9. Natural gas is generally
(a) Boron (b) Methane (c) Nitrogen (d) Oxygen

10. Coal, oil and natural gas are called
(a) Heat, gas and oil resources (b) Coal, heat and oil resources
(c) Fossil fuels (d) Coal, oil and limestone resources

11. _________ crude oil is a fuel in an aeroplane.
(a) Diesel (b) Water gas (c) Liquid gas (d) Kerosine

12. Crude oil contains a lot of compounds but mostly _________.
(a) Coal and gas (b) Petrol and gas
(c) Alcohols and phenols (d) Hydrocarbons

13. _________ is used in making more useful compounds.
(a) Phenols and alcohols (b) Cracking
(c) Make oil powerful (d) None of these

14. Cracking is a kind of reaction namely_________.
(a) Neutralisation (b) Ignition
(c) Thermal decomposition (d) None of these

ANSWERS

1.	d	2.	b	3.	a	4.	b	5.	c	6.	a	7.	d
8.	b	9.	b	10.	c	11.	d	12.	d	13.	b	14.	c

AMINO ACIDS AND PROTEINS

1. **Amino acids are ________.**
   (a) Positive (b) Hydrophobic (c) Electric (d) None of these
2. **The structure of an amino acid comprises an amino group, a carboxyl group, a hydrogen atom and a ________.**
   (a) R-group (b) P-group (c) Q-group (d) S-group
3. **Tertiary structure is primarily owed to interactions amongst ________.**
   (a) R-groups (b) S-groups (b) P-groups (b) Q-groups
4. **How can a protein be denatured it becomes dysfunctional?**
   (a) Increased temperature and added hydrochloric acid
   (b) Decreased temperature and added hydrochloric acid
   (c) Both a and b (d) None of these
5. **A protein's primary structure states its final ________.**
   (a) Chemical behaviour (b) Physical behaviour
   (c) Positivel behaviour (d) Negativl behaviour
6. **________ common amino acids are used as building blocks.**
   (a) 10 (b) 15 (c) 20 (d) 25
7. **________ common amino acids are considered essential.**
   (a) 6 (b) 8 (c) 10 (d) 12
8. **What do the Amino Acid and series of amino acid of a explicit protein choose.**
   (a) The bases in the gene that encodes the protein
   (b) The bases in the end that encodes the protein
   (c) The ends in the gene that encodes the protein
   (d) None of these
9. **Disulphide bond is essential to the formation of ________-of a protein.**
   (a) Quaternary structure (b) Half structure
   (c) Complete structure (d) None of these
10. **________ codons are made by amino acids.**
    (a) 25 (b) 45 (c) 64 (d) 85

ANSWERS

1.	b	2.	a	3.	a	4.	a	5.	a	6.	c	7.	b
8.	a	9.	a	10.	c								

WATER CYCLE, CARBON CYCLE & NITROGEN CYCLE

1. **Precipitation takes place when**
   (a) Water becomes gas (b) During a chemical reactions
   (c) Water falls from clouds as rain or snow (d) None of these
2. **Water evaporates from the surface of the sea when water vapour gets into the ______.**
   (a) soil (b) air (c) sea (d) None of these
3. **Carbon dioxide is detached from the atmosphere by the process of ______.**
   (a) Combustion (b) Decomposition (c) Respiration (d) Photosynthesis
4. **Carbon dioxide is released into atmosphere during the process of ______.**
   (a) Combustion (b) Respiration (c) Photosynthesis (d) None of these
5. **Plants receive nitrogen from the soil by**
   (a) Mud (b) Oxide (c) Nitrate (d) None of these
6. **Bacteria which revolve nitrite into nitrate are called**
   (a) Oxidising (b) Nitrifying (c) Dangerous (d) None of these
7. **Bacteria which revolve nitrate into nitrogen gas are called**
   (a) Living (b) Sino (c) Denitrifying (d) None of these

ANSWERS

1.	c	2.	b	3.	d	4.	d	5.	c	6.	b	7.	c

SOME IMPORTANT SCIENTIFIC REASONS

1. **What is Dry Ice?**

   Solid Carbon dioxide at a temperature of - 80°C is called Dry Ice.

2. **Why the proportion of oxygen in air remains constant despite its utilisation in respiration?**

   There are certain processes which take place on earth, which produce oxygen, i.e. plants and trees. The amount of oxygen consumed during respiration is compensated by these processes.

3. **Why mercury is used in thermometers?**

   Mercury is used in thermometers due to the following reasons:
   - Mercury is easily and abundantly available in pure form.
   - Can be distinctly observed in the capillary tube.
   - Has a capacity of uniform expansion and capacity to remain liquid even at a great range of temperature.

4. **Why the balloons rise in the air?**

   The balloons are filled with hydrogen or helium and these gases are lighter than air. So, it causes balloons to rise in air.

5. **Why does the blotting paper absorb ink?**

   This is due to the capillary action. The blotting paper has a number of capillaries with very fine pores. When a blotting paper comes into contact with the ink, the ink enters the capillaries and the blotting paper absorbs it.

6. **Why water wets the glass but mercury does not?**

   The force of adhesion between the molecules of glass and water is greater than the force of cohesion between the molecules of water that is why it wets the glass. In mercury, the case is reverse. That is why it doesn't wet the glass.

7. **Why an iron nail floats on mercury but sinks in water?**

   This is due to the upward thrust produced by the displaced volume of mercury, greater than its own weight, whereas the upward thrust produced by an equal volume of water is less than the weight of the nail and hence it sinks.

8. **Why a water tank is cooler than the surface of the earth surrounding it?**

   This is all due to evaporation. Cooling is caused by evaporation. As the water evaporates from the surface of the tank or water pond, heat is taken away. This phenomenon results in lowering the temperature of the remaining water.

9. **Why does a glass often crack when hot water is poured over it?**

   This is due to expansion of inner surface of glass tumbler. When a very hot liquid is poured on it, the inner surface of the glass expands due to high temperature of liquid as compared to outside which receives less temperature. The uneven expansion of glass produces cracks.

10. **Why is it preferable to use a cooking pan with black bottom?**

    This is due to the absorption of heat. The black bottom absorbs more heat as compared to non-polished surface, so it helps in cooking.

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11. Why is it not advisable to sleep under trees during night?.

During night the plants release CO_2 which is a poisonous gas and injurious to health. That is why, it is not advisable to sleep under trees during night.

12. Why the ice and salt are used in manual making of ice-cream?

A mixture of ice and salt is used because the salt has capacity to reduce the temperature of ice by decreasing its freezing point. That is why, ice and salt mixture is used as freezing agent in manual ice-cream making.

13. Why the sun appears red at the time of sunset and sunrise?

This is due to the scattering of light by small particles of dust near the surface of earth. The light travels relatively without hindrance, that is why the sun appears red at the time of sunset and sunrise.

14. Why the ozone layer is necessary for animals' and plants' survival?

Ozone layer in the upper atmosphere is very necessary for plant and animal survival because it absorbs the ultraviolet rays which are very dangerous for animal health. In the absence of ozone layer the animate world will suffer from various diseases because ultra violet rays cause cancer of skin etc. That is why, the ozone layer is necessary and essential for animal as well as plant survival.

15. Why the sky appears completely black when viewed from the moon.

The moon has no atmosphere, so the sky looks completely black when viewed from the moon.

16. Why the sky looks blue when viewed from the earth during daytime?

This is due to reflection of blue light by the atmosphere. Atmosphere reflects blue light. Sky appears blue when viewed from the earth.

17. Why the electrical light filaments are made up of Tungsten?

The electrical light filaments are made up of Tungsten because they can conduct high temperatures easily. The temperature of the filament of an electric lamp is about 2700°C, when it glows. The Tungsten can withstand a temperature of about 3410°C. That is why, the electrical filaments are made up of tungsten.

18. When the feather and stone fall at the same rate?

Feather and stone will fall at the same rate when they fall freely under vacuum.

19. Why a bulb makes a bang on breaking?

A bulb makes a bang on breaking due to the vacuum created inside the bulb. When the bulb breaks the air outside, the bulb rushes into the vacuum in order to fill it. During rushing of air, bang is produced.

20. Why the breathing is more difficult on mountains than on the plains?

It all occurs due to the decreased amount of oxygen on mountains. With increase in altitude, the pressure of air and the oxygen content of air goes decreasing. Thus, breathing is difficult on the mountains than on the plains.

21. Why steam produces more severe burns than the boiling water?

The steam contains more heat than water at the same temperature. Thus, it causes more severe burns than the boiling water at the same temperature.

22. Why small space is left at the joint between two rails?

A small space is left at the joint between two rails because it allows expansion due to heat.

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IMPORTANT LAWS IN CHEMISTRY

Avogadro's Law

Equal volumes of gases beneath the same temperature and pressure conditions will enclose equal numbers of particles.

Boyle's Law

At constant temperature, the volume of a given gas is inversely proportional to the pressure of that gas.

$$PV = k$$

Charles' Law

At constant pressure, the volume of a given gas is directly proportional to the temperature of that gas.

$$V = kT$$

Conservation of Energy

Energy can neither be created nor destroyed. This is also called the first law of thermodynamics.

Conservation of Mass

Matter can neither be created nor destroyed, however it can be rearranged. This law is also known as conservation of matter law.

Dalton's Law

The pressure of a mixture of gases is equal to the addition of the partial pressures of the constituent gases.

Definite Composition

A compound is composed of two or more elements chemically united in a distinct ratio by weight.

Faraday's Law

The weight of any element unconventional during electrolysis is proportional to the amount of electricity passing through the cell and also to the correspondent weight of the element.

First Law of Thermodynamics

Total energy of the universe is constant and it can neither created nor destroyed.

Gay-Lussac's Law

The ratio among the combining volumes of gases and the product can be uttered in small whole numbers.

Graham's Law

The rate of diffusion or effusion of a gas is inversely proportional to the square root of its molecular mass.

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Henry's Law

The solubility of a gas is directly proportional to the pressure applied to the gas.

Ideal Gas Law

The state of an ideal gas is determined by its pressure, volume, and temperature according to the equation

$$PV = nRT$$

Multiple Proportions

When elements combine, they do so in the ratio of small whole numbers. The mass of one element connects with a fixed mass of another element according to this ratio.

Periodic Law

The chemical properties of the elements differ periodically according to their atomic numbers.

Second Law of Thermodynamics

Entropy increases over time. Another way of stating this law is to say that heat cannot flow, on its own, from an area of cold to an area of hot.

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INTERESTING CHEMISTRY FACTS

Chemistry is a wonderful science which is full of strange trivia. Here we discuss some interesting facts.

- The term chemistry was derived from the Egyptian word which means earth.
- Hydrogen is the most abundant element in the universe. This element is one of the most common elements to be found on earth and extremely flammable.
- Oxygen is the most abundant element in the earth's atmosphere, crust, and oceans.
- Elements, liquid at room temperature, are bromine and mercury.
- One can melt gallium by holding a lump in the warmth of one's hand.
- 20% of oxygen in the air was produced by the Amazon Rainforest.
- Helium is an element that is lighter than the air that surrounds us thus it floats.
- At a temperature of 3000°C and pressure of 100,000 atm, graphite can be converted into diamond
- The element californium is considered as the most expensive substance in the world.
- Aluminium is the most found metal in the earth's crust.
- Compared to any other element, helium does not harden.
- Chemical name of water is dihydrogen monoxide.
- Due to its low melting point; 29.76 °C, gallium melts on palm of the hand.
- Xenon gas lasers can slash materials that are so hard.
- Melting point of tungsten is 3410°C.
- Mercury is only the metal liquid at room temperature.
- Pure gold is so soft that it can be moulded with the hands.
- An ounce of gold can be stretched into a wire 50 miles long.
- Tooth paste contains chemicals such as monofluorophosphate, sodium sulphate etc.
- Soap is made of vegetable oil and some chemicals.
- Neem oil contains specific antibacterial chemicals so it is good protecting us from bacteria and itches
- Glycerine soap keeps our skin soft..
- Water expands on freezing.
- Water is a substance which includes two parts hydrogen and one part oxygen.
- If you pour a handful of salt into a full glass of water, the water level will in fact go down rather than spilling over the glass.
- It is interesting that hot water freezes faster than cold water.
- In an average adult human body, there is about 250 g of sodium chloride.
- Human body contains many amino acids that help in digestive system.
- Diamond and graphite both are forms of pure carbon.
- Only the letter J is not present in the periodic table.
- The only two non-silvery metals are gold and copper.
- The liquid and solid forms of oxygen are blue.
- The human body contains sufficient carbon to provide lead for about 9,000 pencils.
- Milk contains calcium which is a chemical.

PHYSICS

MULTIPLE CHOICE QUESTIONS

1. **Which of the following device is needed for converting alternating current into direct current?**
   (a) Dynamo (b) Rectifier (c) Transformer (d) Transducer
2. **The lustre of diamond is due to:**
   (a) Reflection (b) Total internal reflection
   (c) Refraction (d) Diffraction
3. **A plant with green leaves placed in red light will appear**
   (a) Black (b) Green (c) Red (d) Violet
4. **Which of the following is electromagnetic radiation**
   (a) X-rays (b) Sound waves (c) Ultrasonic waves (d) Water waves
5. **The common refrigerant used in the domestic refrigerator is**
   (a) Neon (b) Freon/ammonia (c) Spirit (d) None of these
6. **A fuse wire is characterized by**
   (a) High resistance and high melting point (b) Low resistance and high melting point
   (c) High resistance and low melting point (d) Low resistance and low melting point
7. **Who said, 'A body will remain at rest unless an external force acts on the body'?**
   (a) Newton (b) Einstein (c) Archimedes (d) Galileo
8. **Which metal is commonly used as an electromagnet?**
   (a) Copper (b) Iron (c) Nickel (d) Cobalt
9. **When ice melts in a beaker of water, the level of water in the beaker will**
   (a) Increase (b) Decrease
   (c) Remain the same (d) First increase and then decrease
10. **An echo is produced by the of sound waves**
    (a) Refraction (b) Absorption (c) Reflection (d) Diffraction
11. **The dynamo converts**
    (a) Mechanical energy into electrical energy (b) Electrical energy into mechanical energy
    (c) Mechanical energy into Kinetic energy (d) None of these
12. **The unit of electric charge in M.K.S. system is**
    (a) Newton (b) Ampere (c) Watt (d) Coulomb
13. **The oil in the wick of an oil lamp rises up due to**
    (a) Pressure difference (b) Capillary action (c) Osmosis (d) Gravitational force
14. **The Function of the choke in electric circuits is**
    (a) Give relatively large impedance of alternating current
    (b) Give relatively large impedance of direct current
    (c) Regulate the voltage (d) increase the voltage
15. **If the length of a heater coil is reduced by 10% of its original length, then power consumed by the heater will**
    (a) Increase over 10% (b) Decrease by 10% (c) Increase by 5% (d) Decrease by 5%
16. **A red light is used in a traffic signal because**
    (a) It has the longest wavelength and can be easily noticed from a long distance
    (b) It is beautiful and more luminous

(c) It is visible to people even with bad eyesight (d) Color blind people can see it

17. **Color blind people cannot differentiate in following colors**
(a) Orange and blue (b) White and black (c) Red and green (d) Yellow and blue

18. **In deserts clouds do not precipitate because of**
(a) Low pressure (b) Low humidity (c) High wind velocity (d) Low temperature

19. **When iron and wood are exposed to sunlight, the iron rod becomes hot quickly because**
(a) Greater Heat capacity of iron (b) Lower Heat capacity of iron
(c) More density of iron (d) Less density of iron

20. **Water cannot be used to extinguish fire caused by an electric current because**
(a) It may cause another short circuit (b) It may cause hydrolysis
(c) It may cause electrocution (d) It will spoil the wiring

21. **In diesel engines ignition takes place by**
(a) Compression (b) Electrical spark (c) Dynamo (d) Battery

22. **A sprayer machine (perfume bottle) works on**
(a) Newton Laws (b) Archimedes principle
(c) Boyle Law (d) Bernoulli's principle

23. **Cloudy nights are warmer because**
(a) Clouds prevent radiation of heat from ground to air
(b) Of low atmospheric pressure
(c) Of the compact density of air (d) Of relative humidity

24. **If we go to the Himalayas, we feel breathless because**
(a) It is very cold there (b) The density of air is much
(c) The density of air is high (d) Of Less air pressure

25. **What is the approximate velocity of sound in Vacuum?**
(a) 0 m/s (b) 300 m/s (c) 342 m/s (d) 3000 m/s

26. **In deserts clouds do not precipitate because of**
(a) Low pressure (b) Low humidity (c) High wind velocity (d) Low temperature

27. **An echo is produced by _____ sound waves**
(a) Refraction (b) Absorption (c) Reflection (d) Diffraction

28. **What is the approximate velocity of sound in air?**
(a) 3 m/s (b) 30 m/s (c) 300 m/s (d) 3000 m/s

29. **Which of the following is not a primary colour?**
(a) Blue (b) Green (c) Red (d) Black

30. **The speed of light in water is 3/4 of that in air. What is the refractive index of water?**
(a) 3/4 (b) 4/3 (c) 1/4 (d) 1/3

31. **In the case of a concave mirror if object is locatell beyond C, the image will be**
(a) Real, erect and diminished (b) Real, inverted and of the same size
(c) Real, inverted and diminished (d) Not real, large and un-proportional

32. **Sound travels fastest through**
(a) Vacuum (b) Steel (c) Water (d) Air

33. **The process of transfer of heat by matter but without actual movement of the particles themselves is called**
(a) Conduction (b) Convection (c) Radiation (d) None of the above

34. **A body is floating in water at 4°C. If temperature reaches 100°C, then the body will**
(a) Sink fully (b) Float freely

(c) Have some more part of it submerged under water
(d) Have no change in its position

35. **Beta rays have ______ charge?**
(a) Negative (b) Positive (c) Variable (d) No charge

36. **Banking of curves is done to provide**
(a) Centripetal force (b) Centrifugal force
(c) Centrifugal acceleration (d) Angular velocity

37. **What are ultrasonic waves?**
(a) Sound waves having frequency shorter than audio frequency range
(b) Sound waves produced in a vacuum
(c) Sound waves having frequency higher than audio-frequency range
(d) None of these

38. **Alpha rays have ______ charge?**
(a) Negative (b) Positive (c) Variable (d) No charge

39. **The source of solar energy is**
(a) Nuclear fission (b) Nuclear fusion (c) Sinking of the sun (d) None of these

40. **A radar which detects the presence of an enemy aircraft uses**
(a) Sound waves (b) Radio waves (c) Electric waves (d) Ultrasonic waves

41. **These are not electromagnetic in nature:**
(a) Infrared rays (b) Ultra-violet rays (c) Radio waves (d) Sound waves

42. **Which of the following have the shortest wavelength?**
(a) Radio waves (b) Infrared Rays (c) Ultra Violet Rays (d) X-rays

43. **Food is cooked quickly in a pressure cooker because**
(a) Boiling point of water is decreased (b) Boiling point of water is increased
(c) It absorbs heat quickly (d) It retains heat for a long duration

44. **In an earthen pot cooling of water depends upon**
(a) Outside temperature (b) Atmospheric humidity
(c) Wind (d) All of the above

45. **A fuse wire is used to**
(a) To make the electrical circuit strong (b) Convert AC into DC
(c) Convert DC into AC
(d) Prevent an unduly high electric current to pass through a circuit

46. **Gamma rays have ______ charge.**
(a) Negative (b) Positive (c) Variable (d) No charge

47. **There are two long-range forces among the fundamental forces. One is Gravity; Name the second:**
(a) Weak Nuclear Force (b) Electromagnetic Force
(c) Nuclear Force (d) Strong Nuclear Force

48. **A solid needle placed horizontally on the surface of the water floats due to**
(a) Surface tension (b) Capillary action (c) Cohesion (d) Adhesion

49. **Effect of light on photocells produces**
(a) Energy (b) Current (c) Photosynthesis (d) None of these

50. **Human eyes respond best to green light at 550 nm, which is also approximately the brightest colour in sunlight at:**
(a) Sun's surface (b) Earth's surface (c) Water's surface (d) Ocean's surface

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51. **A 100 watt bulb is kept on for a period of 10 hours per day in the month of September. The electrical energy consumed in that month in kilowatt hours (kWh) is**
(a) 30 kWh (b) 3 kWh (c) 3000 kWh (d) 1000 kWh

52. **Which of the following is a good conductor of heat but bad conductor of electricity?**
(a) Asbestos (b) Celluloid (c) Iron (d) Mica

53. **A sudden fall in barometer reading indicates**
(a) Clear weather (b) Hailstorm (c) Storm (d) Heavy rainfall

54. **Sound travels with a different speed in different media. In what order does the velocity of sound increase in these media?**
(a) Water, iron and air (b) Iron, air and water (c) Air, water and iron (d) Iron, water and air

55. **If the distance between two charges is halved, then the force between them becomes**
(a) Half (b) Double (c) Four times (d) One-fourth

56. **To increase the magnifying power of a telescope, the focal length of**
(a) Objective lens should be increased (b) Objective lens should be decreased
(c) Eye-piece lens should be increased (d) Eye-piece lens should be decreased

57. **An object moving around in a circle is moving with**
(a) Uniform velocity (b) Uniform speed (c) Variable velocity (d) Variable speed

58. **When water is heated from 0° C to 10° C, the volume of water**
(a) Increases steadily (b) Decreases steadily
(c) First increases then decreases (d) First decreases then increases

59. **The shortest wavelength humans can detect is deep blue or violet at about:**
(a) 500 nm (b) 466 nm (c) 300 nm (d) 200 nm

60. **In electric fittings, the wires are earthed because**
(a) In case of a short circuit, current passes to the earth
(b) It avoids leakage of electricity
(c) It completes the electric circuit (d) It reduces fluctuation

61. **Which of the following metals is used in aircraft?**
(a) Chromium (b) Titanium (c) Palladium (d) None of these

62. **The force of gravity on the moon is**
(a) Less than on the earth as the moon has a smaller mass
(b) The same as on the earth
(c) More than the earth (d) There is no gravitational force at all

63. **A transformer is used to**
(a) Increase DC voltage (b) Increase or decrease AC voltage
(c) Decrease DC voltage (d) Convert DC into AC

64. **When milk is churned, the cream from it is separated due to**
(a) Gravitational force (b) Centrifugal force (c) Frictional force (d) Heat

65. **The element used in an electric filament is**
(a) Copper (b) Aluminium (c) Iron (d) Tungsten

66. **The sky is blue in colour due to**
(a) Refraction (b) Reflection (c) Diffraction (d) Dispersion

67. **During rusting**
(a) Iron gains weight (b) Iron loses weight
(c) Remains unchanged (d) Iron volatilizes

68. **Unit of energy is same as that of**
(a) Work (b) Power (c) Force (d) Acceleration

69. **The longest wavelength we can see is deep red at about:**
(a) 800 nm (b) 700 nm (c) 600 nm (d) 730 nm

70. **How fast something is moving is called its speed. What measures speed in particular direction?**
(a) Deceleration (b) Acceleration (c) Circular speed (d) Velocity

71. **Mercury is commonly used as a thermometric fluid rather than water because**
(a) It has high coefficient of expansion (b) If does not stick to glass surface
(c) Mercury has greater visibility than water (d) All of above

72. **When a stone is dropped in a well the splash is heard after 1.5 seconds after the stone hits the water surface. If the velocity of sound is 327 m/s the depth of the well is**
(a) 227 m (b) 490.5 m (c) 660 m (d) 981 m

73. **Magnetic field does not interact with**
(a) Stationary charge (b) Moving charge
(c) Stationary permanent magnets (d) Moving permanent magnets

74. **The frequency of radio waves lies in the range:**
(a) 20Hz to 20 KHz (b) 3 kHz to 300 GHz (c) 600 MHz (d) Above 600 MHz

75. **When water boils, its temperature**
(a) Begins to increase (b) Begins to decrease (c) Remains constant (d) Fluctuates

76. **Water has maximum density at**
(a) Room temperature (b) 0°C (c) 4°C (d) 100°C

77. **The critical angle of a glass slab increases with**
(a) Increase in the refractive index of glass (b) Decrease in the refractive index of glass
(c) Increase in temperature (d) None of these

78. **When a recorded tape is played after being subjected to a magnetic field, then**
(a) Reproduction is excellent (b) Recorded information is lost
(c) Only high frequency reproduction takes place
(d) Only low frequency reproduction takes place

79. **Cosmic rays**
(a) Are charged particles (b) Are uncharged particles
(c) Can be charged as well as uncharged (d) None of these

80. **Rectifiers are used to convert**
(a) DC to AC (b) AC to DC
(c) High voltage to low voltage (d) Low voltage to high voltage

81. **The terminal colours of the rainbow are**
(a) Violet and red (b) Violet and green (c) Red and green (d) Red and blue

82. **Which of the following illustrations is not based on the principle of pressure?**
(a) Swelling of dried grapes in water (b) Collecting lotion with an eye-dropper
(c) Bursting of a cycle tube in summer (d) Rise of water in a drinking straw

83. **The colour of the ocean appears to be blue because the sunlight falling on it is**
(a) Reflected (b) Refracted (c) Absorbed (d) Scattered

84. **A needle when placed slowly on the surface of water in a horizontal position appears to float. The phenomenon is an example of**
(a) Capillary action (b) Surface tension
(c) Osmosis (d) Archimedes' principle

85. **Ultraviolet rays make some substances shine. This phenomenon is called as?**
(a) Glowing (b) Ingenious (c) Fluorescence (d) None of these

86. **The best conductor of electricity is**
(a) Iron (b) Aluminium (c) Copper (d) Silver

87. **Two bodies of masses 1 kg and 4 kg have equal kinetic energies. The ratio of their linear moment a is**
(a) 1/2 (b) ¼ (c) 1/8 (d) 1/16

88. **A person is sitting facing the engine in a moving train. He tosses a coin. The coin falls behind him. This shows that the train is**
(a) Moving forward with a finite acceleration (b) Moving forward with a finite retardation
(c) Moving forward with a uniform speed (d) Moving backward with a uniform speed

89. **Which of the following are not deflected by electric and magnetic fields?**
(a) X-rays (b) Electrons (c) Gamma-rays (d) Alpha rays

90. **Sound waves in air are:**
(a) Longitudinal (b) Transverse
(c) Neither longitudinal nor transverse (d) Stationary

91. **Normal range of the frequency of sound which the human beings can hear is:**
(a) Less than 20 Hz (b) 20 Hz to 20,000 Hz
(c) More than 25,000 Hz (d) All of these

92. **The loudness of sound depends upon its:**
(a) Wavelength (b) Frequency (c) Amplitude (d) All the above

93. **Sound above a frequency of 20000 Hz is called:**
(a) Supersonic sound (b) Infrasonic sound (c) Hypersonic sound (d) Ultrasonic sound

94. **A rocket works on the principle of conservation of**
(a) Mass (b) Energy
(c) Linear momentum (d) Angular momentum

95. **A moving bullet hits a solid target resting on a frictionless surface and gets embedded in it. What is conserved in this process?**
(a) Both momentum and kinetic energy (b) Kinetic energy alone
(c) Momentum alone (d) Neither momentum nor kinetic energy

96. **A bomb, initially at rest, explodes into a large number of tiny fragments. The total momentum of all the fragments**
(a) Is zero (b) Is infinity
(c) Depends on the total mass of all the fragments
(d) Depends on the speeds of various fragments

97. **Choose the only scalar quantity from the following**
(a) Energy (b) Torque (c) Momentum (d) Force

98. **Choose the only vector quantity from the following**
(a) Energy (b) Work (c) Density (d) Torque

99. **A microphone converts:**
(a) Electrical energy into sound energy (b) Sound energy into electrical energy
(c) Sound energy into mechanical energy (d) Sound energy into chemical energy

100. **A bullet is fired from a rifle which recoils after firing. The ratio of the kinetic energy of the bullet and that of the rifle is**
(a) Zero (b) One (c) Less than one (d) More than one

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101. **A body is floating in a liquid in a beaker. The whole system is allowed to fall freely under gravity. The up thrust on the body due to the liquid is**
(a) Zero
(b) Equal to the weight of the body in the liquid
(c) Equal to the weight of the body in Air
(d) Equal to the weight of the immersed portion of the body

102. **The characteristic of sound which enables us to distinguish two musical notes having the same frequency and loudness is called:**
(a) Pitch (b) Intensity (c) Timber (d) None of the above

103. **A Decibel is a:**
(a) Musical instrument
(b) Highest frequency emitted by a tuning fork
(c) A measure of intensity level
(d) A measure of clarity of sound

104. **An earth satellite is kept moving in orbit by the centripetal force provided by**
(a) The burning of fuel in its engine
(b) The ejection of hot gases from its exhaust
(c) The gravitational attraction of the sun
(d) The gravitational attraction of the earth

105. **An Stone is released from an orbiting earth satellite. The Stone will**
(a) Fall to the earth
(b) Go away from the earth and get lost in outer space
(c) Continue moving along with the satellite in the same orbit and with the same speed
(d) Fall through a certain distance and then move in a new orbit around the earth

106. **When sound waves travel from air to water, which of the following quantities remains unchanged?**
(a) Speed (b) Frequency (c) Intensity (d) Wavelength

107. **The walls of the auditorium built for musical concerts should sound.**
(a) Attenuate (b) Absorb (c) Transmit (d) Reflect

108. **Astronauts in a capsule which is in a stable orbit around the earth are in 'weightless' condition. The reason for this is that**
(a) The capsule and its contents are, falling freely at the same rate
(b) There is no gravitational force acting on them
(c) The gravitational force of the earth balances that of the sun
(d) There is no atmosphere at the height at which they are orbiting

109. **During a journey from the earth to the moon and back, the maximum fuel is used up in order to overcome**
(a) The earth's gravity at take-off
(b) The moon's gravity at lunar landing
(c) The moon's gravity at lunar take-off
(d) The e..th's gravity at re-entry into earth's atmosphere and soft landing

110. **The escape velocity for a planet is the minimur velocity with which a body must be projected in order that it may escape the planet's gravitational pull. What is the escape velocity for earth?**
(a) 9.2 km/s (b) 10.2 km/s (c) 11.2 km/s (d) 12.2 km/s

111. **The escape velocity for a body projected vertically upwards from the surface of the earth is V, If the body is projected in a direction making an angle of 30° with the vertical, the escape velocity**
(a) Becomes half
(b) Becomes double
(c) Becomes one-fourth
(d) Remains V

112. **The escape velocity for earth is V_e what is the escape velocity for a planet whose mass and radius are twice those of the earth?**
(a) V_e (b) $2V_e$ (c) $4V_e$ (d) $16V_e$

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113. **The distance from crest to crest of any wave is called its:**
(a) Frequency (b) Wavelength (c) Speed (d) Amplitude

114. **Choose the only correct statement. The escape velocity of a body projected from a planet depends upon**
(a) The mass of the larger body
(b) Mass of the smaller body
(c) The average radius of the planet
(d) The average density of the planet

115. **Choose the only right statement. The orbital speed of a satellite in a stable orbit around a planet depends upon**
(a) The average radius of the planet
(b) The height of the satellite above the planet
(c) The acceleration due to gravity of the planet
(d) The mass of the satellite

116. **The law of universal gravitation was propounded by**
(a) Galileo (b) Copernicus (c) Newton (d) Kepler

117. **The laws concerning the motion of planets were suggested by**
(a) Kepler (b) Galileo (c) Einstein (d) Tycho Brahe

118. **The earth attracts the moon with a force F. The moon attracts the earth with a force**
(a) Less than F (b) Equal to F (c) More than F (d) Equal to F/6

119. **If the distance between the earth and the moon suddenly becomes half the present value, the gravitational force between them**
(a) Remains unchanged
(b) Becomes half
(c) Becomes one-fourth
(d) Becomes four times

120. **A body has a mass M and a weight W on earth. If it is taken to the moon**
(a) Both M and W will remain the same
(b) Both M and W will change
(c) M will remain the same but W will decrease
(d) W will remain the same but M will decrease

121. **Echo is formed as a result of:**
(a) Refraction of sound
(b) Interference of sound
(c) Diffraction of sound
(d) Reflection of sound

122. **Beats are examples of:**
(a) Diffraction (b) Polarization (c) Interference (d) None of these

123. **An air bubble in water will act as**
(a) Convex Mirror (b) Convex Lens (c) Concave Mirror (d) Concave Lens

124. **Optical fibre works on the principle of**
(a) Refraction
(b) Total internal reflection
(c) Scattering
(d) Interference

125. **Velocity of sound in a gas at constant temperature is independent of:**
(a) Pressure only
(b) Humidity
(c) Density and pressure
(d) Frequency

126. **If the earth is assumed to be a homogeneous sphere and if, somehow, it contracts to half its present size, the duration of the day will be**
(a) 6 hours (b) 12 hours (c) 24 hours (d) 48 hours

127. **If two bodies of different masses, initially at rest, are acted upon by the same force for the same time, then both bodies acquire the same**
(a) Velocity (b) Momentum (c) Acceleration (d) Kinetic energy

128. **The work done in raising a body of mass 2 kg to a height of 1 metre above the ground is (the acceleration due to gravity is 10 m/s)**
(a) Zero (b) 2 joule (c) 10 joule (d) 20 joule

129. The period of revolution of a geostationary satellite is
(a) 12 hours (b) 1 day (c) 30 days (d) 365 days

130. The height of a geostationary satellite above the surface of the earth is approximately
(a) 36 km (b) 360 km (c) 3600 km (d) 36000 km

131. A simple pendulum has a time period T. If it is taken to the moon (where the acceleration due to gravity is one-sixth of that on earth), its time period will
(a) Remains equal to T (b) Becomes 6T
(c) Becomes T/6 (d) Becomes slightly more than 2T

132. What is the speed of sound in water?
(a) 1250 m/s (b) 1350 m/s (c) 1450 m/s (d) 1550 m/s

133. Which one of the following parameters of a wave undergoes a change when the wave is reflected from a boundary?
(a) Intensity (b) Wavelength (c) Speed (d) Frequency

134. A man standing in front of a high wall fires a gun. He hears the echo 2 seconds after the gun is fired. If the speed of sound is 340 m/s, how far is the wall from the man?
(a) 85 m (b) 170 m (c) 340 m (d) 680 m

135. What is the speed of sound in water?
(a) Around 1,000 m/sec. (b) Around 1,200 m/sec.
(c) Around 1,440 m/sec. (d) Around 900 m/sec.

136. What is Quartz?
(a) Mineral that is made of silica (b) Mineral that is made of carbon
(c) Mineral that is made carbon and silicon (d) None of these

137. Which of the following is a physical change?
(a) Burning of cooking gas (b) Souring of milk
(c) Digestion of food (d) Dissolution of sugar into water

138. Conversion of a substance directly from solid to vapour state is known as
(a) Vaporization (b) Sublimation (c) Decomposition (d) Ionization

139. What is called the device that produces an intense beam of light with a precise defined wavelength?
(a) Maser (b) Beam gun (c) Laser (d) Time gun

140. What is called every substance on earth, which is not made from animals and plants?
(a) Solid (b) Mineral (c) Fossils (d) Inorganic

141. What is called the rate of doing work or consuming energy?
(a) Power (b) Force (c) Power rate (d) Work done

142. How heat energy is transferred?
(a) Radiation (b) Convection (c) Conduction (d) All of these

143. What is called any substance toxic to insects?
(a) Insecticide (b) pesticide (c) Toxics (d) Poison

144. Permanent hardness of water is due to the presence of
(a) Calcium bicarbonate (b) Magnesium bicarbonate
(c) Calcium sulphate (d) Sodium bicarbonate

145. Which matter is used in storage batteries?
(a) Copper (b) Lead (c) Aluminium (d) Zinc

146. Which of the following constituents of pollutant exhaust is hazardous to man?
(a) Carbon monoxide (b) Carbon dioxide (c) Lead particles (d) Carbon particles

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147. Which branch of physics is based on the transmission of light pulses along a glass fibre and is used in telecommunications?
(a) Fibre optics (b) Coaxial Cable (c) Fibre cable (d) Optics

148. There are four fundamental interactions believed to be at work in the physical universe. What these are called?
(a) Natural forces (b) Fundamental forces
(c) Basic forces (d) Natural forces

149. Temporary hardness of water is due to the presence of
(a) Calcium sulphate (b) Calcium bicarbonate
(c) Magnesium sulphate (d) Calcium chloride

150. Which of the following metals is in liquid state at normal room temperature?
(a) Sodium (b) Radium (c) Mercury (d) Silicon

151. What are called the rays with a shorter wavelength than light?
(a) Gamma rays (b) X-rays (c) Ultra-violet rays (d) All of these

152. A beam of white light is broken up into its component colours when it passes through a triangular glass prism. What this optical phenomenon is called?
(a) Reflection (b) Dispersion (c) Refraction (d) Spectrum

153. In nuclear physics, what is called a fission reaction that is maintained because neutrons released by splitting of some nuclei themselves go on to split others, releasing even more neutrons?
(a) Chain reaction (b) Speed reaction (c) Fast reaction (d) Atomic reaction

154. Light is made up of many colours. Together these are known as a spectrum. Pick out the group of three primary colours?
(a) Red, Green, Magenta (b) Red, Green, Yellow
(c) Red, Green, Blue (d) Yellow, Green, Blue

155. Velocity of sound in a gas increases with increase of:
(a) Temperature (b) Pressure (c) Humidity (d) Frequency

156. Albert Einstein received the Noble prize in physics for his work on:
(a) Gravitation (b) Relativity
(c) Photoelectric effect (d) None of these

157. Cobalt-57 is radioactive substance, emitting beta particles. The half-life for this isotope is 270 days. If 100 mg of the isotope is kept in an open container, the mass of cobalt-57 left after 540 days will be:
(a) 100 mg (b) 50mg (c) 25 mg (d) zero

158. The element used for radioactive carbon dating-is:
(a) C-14 (b) U-234 (c) U-238 (d) Po-94

159. Which of the following types of radiation is the most penetrating?
(a) Alpha (b) Beta
(c) Gamma (d) All re equally penetrating

160. Microwave ovens produce microwave radiations of wavelength of the order of:
(a) 3 cm (b) 3 m (c) 3×10^{-2} m (d) 3×10^{-6} m

161. At absolute zero temperature, a semiconductor acts as a/an:
(a) Dielectric (b) Insulator (c) Conductor (d) Fluid

162. n-type semiconductors will be obtained, when germanium is doped with:
(a) Phosphorus (b) Aluminium (c) Arsenic (d) Either A or C

163. The charge carriers in p-type semiconductors are:
(a) Positrons (b) Protons (c) Holes (d) Alpha particles

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164. **The charge carriers in n-type semiconductors are:**
(a) Electrons (b) Protons and electrons
(c) Holes (d) Electrons and holes

165. **A semi-conductor crystal doped with an acceptor is called Semiconductor.**
(a) N - type (b) P - type (c) NPN type (d) PNP -type

166. **Which type of impurities is doped with Si or Ge to prepare n-type semi-conductor?**
(a) Bivalent (b) Trivalent (c) Tetravalent (d) Pentavalent

167. **Which of the following particles is the heaviest?**
(a). Neutron (b) proton (c) Electron (d) meson

168. **A diode is used to convert:**
(a) D.C. into A.C. (b) A.C. into D.C. (c) Both (d) None of the above

169. **The number of electrons in the $_{92}U^{235}$ nucleus is:**
(a) 92 (b) 235 (c) 143 (d) Zero

170. **Which is heavy water?**
(a) Water in which soap doesn't lather (b) Compound of heavy oxygen and hydrogen
(c) Compound of deuterium and oxygen (d) Water at 4°.C

171. **Which of the following is used in an oven?**
(a) X-rays (b) UV rays (c) Microwaves (d) Radio waves

172. **Why cooking become so fast in pressure cooker?**
(a) It decreases the boiling point (b) It increases the boiling point
(c) Boiling point will remain same (d) Cooking is not getting quicker

173. **Ice sinks in:**
(a) Water (b) Mercury (c) Alcohol (d) It always floats

174. **How does a ball, which falls down bounce up?**
(a) 1st law of motion (b) 2nd law of motion (c) 3rd law of motion (d) None of these

175. **Why does a ball, which falls down, bounce up?**
(a) Gravity (b) Elasticity (c) Speed (d) Acceleration

176. **Which of the following is more elastic?**
(a) Glass (b) Rubber (c) Steel (d) Sponge

177. **An alpha particle consists of:**
(a) 2 protons, 2 electrons and 2 electrons (b) 2 protons, 2 electrons and 1 electron
(c) 2 protons and 2 neutrons (d) None of these

178. **A beta particle is a (n):**
(a) Electron (b) Proton (c) Neutron (d) Positron

179. **Which of the following has the least mass?**
(a) Electron (b) Proton (c) Higgs Boson (d) Positron

180. **Who is called the father of the atomic bomb?**
(a) Clark Maxwell (b) Oppenheimer (c) Albert Einstein (d) Michael Faraday

181. **The term nucleon is used to refer to:**
(a) An electron (b) A photon
(c) A positron (d) Either a neutron or a proton

182. **The energy released when 1 a.m.u is completely annihilated is:**
(a) 9.31 MeV (b) 93.1 MeV (c) 931 MeV (d) 9310 MeV

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183. Which of the following are not deflected by electric and magnetic fields?
(a) Beta rays (b) Electrons (c) *Gamma-rays* (d) Alpha rays

184. Which of the following isotopes of uranium is used as a fuel in nuclear reactors?
(a) U-238 (b) U-235 (c) U-237 (d) All the above

185. Which of the following is used as a coolant in nuclear reactors?
(a) Liquid hydrogen (b) Water (c) Heavy water (d) None of these

186. A-geostationary satellite:
(a) Remains stationary in space
(b) Orbits the earth with a period of 24-hr
(c) Orbits the earth with a period of 28 days
(d) None of the above is true

187. The resistance of a good voltmeter is:
(a) Very high
(b) Very low
(c) May be high or low
(d) A resistance equal to that of all other components in the circuit

188. A man is standing 1 foot in front of a plane mirror. The distance between him and his image
(a) 2ft (b) 1.5 ft (c) 2.5 it (d) 4 ft

189. The focal length of a plane mirror is:
(a) Zero (b) Infinite (c) Negative (d) Finite

190. A virtual image formed by a mirror (any type) is:
(a) Always larger than the object
(b) Always smaller than the object
(c) Always erect
(d) None of the above

191. The rear view mirror used by auto drivers is a mirror.
(a) Plain (b) Concave (c) Convex (d) Inverted

192. Which of the following can be used as a magnifying glass?
(a) Concave mirror (b) Concave lens (c) Convex mirror (d) All the above

193. A convex mirror is used in motor vehicles to look at the back traffic because:
(a) In it the image is formed as far behind the mirror as the object is in of it
(b) It always forms real images of objects
(c) It covers a wide field of view and always gives an upright image
(d) The polish on its surface last for a long time

194. A person standing in front of finds his image smaller than This implies that the mirror is:
(a) Plane (b) Concave (c) Convex (d) None of these

195. When white light passes through a glass prism in the emergent beam, the ray which is deviated least is the
(a) The violet ray (b) The red ray (c) The green ray (d) The yellow ray

196. Which one of the following can be used to focus sun light?
(a) Plane mirror (b) Concave lens (c) Concave mirror (d) Convex mirror

197. A convex mirror always:
(a) Forms a real image
(b) Forms a virtual image
(c) Forms an inverted image
(d) Produces a larger image than does a plane mirror for the same object distance

198. The distance between the optical centre of a convex lens and its principal focus is called its:
(a) Focal length
(b) Radius of curvature
(c) Power
(d) Magnification

199. A pond of water appears less deep than it really is. This is because of the phenomenon of:
(a) Refraction (b) Reflection (c) Diffraction (d) None of these

200. An air bubble in a glass of water shines brightly due to the phenomenon of:
(a) Diffraction (b) Refraction
(c) Total internal reflection (d) None of these

201. Twinkling of stars is on account of:
(a) Large distance of stars and storms in air (b) Small size of stars
(c) Large size of stars
(d) Large distance of stars and fluctuations in the density of air

202. Total internal reflection can take place when a ray passes from:
(a) Air to glass (b) Glass to air
(c) Water to glass (d) In all the above cases

203. The power of a lens is measured in
(a) Lumen (b) Watt (c) Horse power (d) Dioptre

204. The lens used rectify the defect of farsightedness is a:
(a) Concave lens (b) Convex lens (c) Spherical lens (d) Plane glass

205. The defect of eye called myopia corrected by using a:
(a) Converging lens (c) Diverging lens (c) Plano convex lens (d) None of these

206. Which among the following types of lenses prescribed by doctors for a patient suffering from astigmatism?
(a) Convex lens (b) Concave lens (c) Spherical lens (d) None of these

207. The defect of eye called hypermetropia, is corrected by using a:
(a) Convex lens (b) Concave lens (c) Spherical lens (d) Cylindrical lens

208. Soap film exhibits brilliant colours in sun-light due to:
(a) Dispersion of light (b) Scattering of light
(c) Interference of light (d) Diffraction of light

209. In a telescope the focal length of the objective is______ than the focal length of the eyepiece.
(a) Same as (b) More
(c) Less (d) May be any of the above

210. The final image formed in a compound microscope is:
(a) Virtual and diminished (b) Real and magnified
(c) Virtual and magnified (d) None of the above

211. To get higher magnification by a magnifying glass, the lens used should be of:
(a) Short focal length (b) Less than 1 m focal length
(c) Large focal length (d) None of these

212. Photoelectric effect and Compton effect support the:
(a) Wave theory of light (b) Corpuscular theory of light
(c) Electromagnetic theory of light (d) None of these

213. The velocity of light is maximum in:
(a) Water (b) Vacuum (c) Diamond (d) Water

214. In 1905 Theory of Relativity was purposed by:
(a) Gilbert (b) Henry (c) Newton (d) Einstein

215. In Fahrenheit scale lower fixed point & upper fixed point:
(a) 22 F & 202 F (b) 32 F & 212 F (c) 42 F & 240 F (d) None of above

216. The capacitance of the capacitor is defined as the charge stored by collection of plates. The unit for Capacitance is?
(a) Coulomb (b) Farad (c) Volt (d) None of above

217. If the temperature of the conductor increases the resistance will:
(a) Increases (b) Decreases (c) Remain same (d) Zero

218. Which device converts chemical energy into electrical energy?
(a) Cell (b) Generator (c) Thermocouples (d) Motor

219. By using the transformer the voltage:
(a) Stepped up (b) Stepped down (c) Remain same (d) A & B

220. Unit of weight:
(a) Centimetre cube (b) Gram per centimetre cube
(c) Newton (d) Kilogram

221. Force of attraction between any two objects:
(a) Friction (b) Up thrust (c) Gravity (d) Weight

222. Which of the following is the force?
(a) Heat (b) Magnetism (c) Kinetic (d) Light

223. The commercial unit of electrical energy is:
(a) Joule (b) Newton (c) Kilo-watt-hour (d) Kilo watt power

224. One calorie is equal to now many joule(s)?
(a) 4 (b) 2 (c) 0.42 (d) 42

225. The fundamental unit of length in S.I unit of measurement is:
(a) Kilometre (b) Meter (c) Yard (d) Foot

226. Which one is a vector quantity?
(a) Mass (b) Torque (c) Distance (d) Time

227. The S.I unit of pressure is:
(a) Pascal (b) Newton
(c) Kilogram per cube meter (d) Newton meter

228. Fuel used in fast breeder reactor is:
(a) Uranium Oxide (b) Uranium Plutonium carbide
(c) Uranium Plutonium Oxide (d) Uranium thorium oxide

ANSWERS

1.	b	2.	a	3.	a	4.	a	5.	b	6.	c	7.	a
8.	b	9.	c	10.	c	11.	a	12.	d	13.	b	14.	a
15.	a	16.	a	17.	c	18.	b	19.	a	20.	a	21.	a
22.	d	23.	a	24.	b	25.	c	26.	b	27.	c	28.	c
29.	d	30.	b	31.	c	32.	b	33.	a	34.	c	35.	a
36.	a	37.	c	38.	b	39.	b	40.	b	41.	d	42.	d
43.	b	44.	d	45.	d	46.	d	47.	b	48.	a	49.	b
50.	b	51.	a	52.	d	53.	c	54.	c	55.	c	56.	d
57.	c	58.	d	59.	c	60.	a	61.	b	62.	a	63.	b
64.	b	65.	d	66.	d	67.	a	68.	a	69.	b	70.	d
71.	d	72.	b	73.	a	74.	b	75.	c	76.	c	77.	b
78.	b	79.	c	80.	b	81.	a	82.	a	83.	d	84.	b

85.	c	86.	d	87.	a	88.	a	89.	c	90.	a	91.	b
92.	c	93.	d	94.	c	95.	c	96.	a	97.	a	98.	d
99.	b	100.	c	101.	a	102.	c	103.	c	104.	d	105.	c
106.	b	107.	a	108.	a	109.	a	110.	c	111.	d	112.	a
113.	b	114.	a	115.	d	116.	c	117.	a	118.	b	119.	d
120.	c	121.	d	122.	c	123.	d	124.	b	125.	c	126.	a
127.	b	128.	d	129.	b	130.	d	131.	d	132.	c	133.	a
134.	c	135.	c	136.	a	137.	d	138.	b	139.	c	140.	b
141.	a	142.	d	143.	a	144.	c	145.	b	146.	a	147.	a
148.	b	149.	b	150.	c	151.	d	152.	b	153.	a	154.	c
155.	a	156.	c	157.	c	158.	a	159.	c	160.	d	161.	b
162.	d	163.	c	164.	a	165.	b	166.	d	167.	a	168.	b
169.	a	170.	c	171.	c	172.	b	173.	c	174.	c	175.	b
176.	c	177.	d	178.	a	179.	c	180.	b	181.	d	182.	c
183.	c	184.	b	185.	c	186.	b	187.	a	188.	a	189.	b
190.	c	191.	c	192.	a	193.	c	194.	c	195.	b	196.	c
197.	b	198.	a	199.	a	200.	c	201	d	202	b	203	d
204	b	205	c	206	b	207	a	208	c	209	b	210	c
211	a	212	d	213	b	214	d	215	b	216	b	217	a
218	a	219	d	220	c	221	c	222	b	223	c	224	a
225	b	226	b	227	a	228	c						

SELF ASSESSMENT TESTS

Test -I

1. **The number of base units in SI are:**
   (a) 3 (b) 6 (c) 7 (d) 9
2. **Which one of the following units is not a derived unit?**
   (a) Pascal (b) Kilogram (c) Newton (d) Watt
3. **Amount of substance in terms of numbers is measured in:**
   (a) Gram (b) Kilogram (c) Newton (d) Mole
4. **An interval of 200μs is equivalent to:**
   (a) 0.2s (b) 0.02s (c) 2×10^{-4}s (d) 2×10^{-6}s
5. **Which one of the following is the smallest quantity?**
   (a) 0.01g (b) 2mg (c) 100μg (d) 5000ng
6. **Which instrument is most suitable to measure the internal diameter of a test tube?**
   (a) Metre ruler (b) Vernier Callipers (c) Measuring tap (d) Screw gauge
7. **A student claimed the diameter of a wire as 1.032 cm using vernier callipers. Upto what extent do you agree with it.**
   (a) 1cm (b) 1.0cm (c) 1.03cm (d) 1.032cm
8. **A measuring cylinder is used to measure:**
   (a) Mass (b) Area (c) Volume (d) Level of a liquid
9. **A student noted the thickness of a glass sheet using a screw gauge. On the main scale, it reads 3 divisions while 8th division on the circular scale coincides with index line. Its thickness is:**
   (a) 3.8cm (b) 3.08mm (c) 3.8mm (d) 30.8m
10. **Significant figures in an expression are:**
    (a) All the digits
    (b) All the accurately known digits
    (c) All the accurately known digits and the first doubtful digit
    (d) All the accurately known and all the doubtful digits.
11. **All the measurable quantities are called:**
    (a) Base quantities
    (b) Physical quantities
    (c) Derived quantities
    (d) Mathematical quantities
12. **The international system of units is commonly called as:**
    (a) ISU (b) SIU (c) SI (d) None of these
13. **Prefixes are the words or letters added before:**
    (a) Base units (b) Derived units (c) SI units (d) Both (a) & (b)
14. **200,000ms^{-1} is written as:**
    (a) 200 cms^{-1} (b) 200sm^{-1} (c) 20 mega s^{-1} (d) 200 kms^{-1}
15. **In scientific notation a number is expressed as some power of:**
    (a) 10 multiplied a number
    (b) 100 multiplied number
    (c) 10 × 10 multiplied a number
    (d) 10^2 multiplied a number
16. **A number 62750 can be expressed in scientific notation as:**
    (a) 62.75×10^4 (b) 6.275×10^4 (c) 0.6275×10^4 (d) 0.06275×10^4

17. **The SI units have advantage that these are easily expressed in power of:**
(a) Two (b) Three (c) Five (d) Ten

18. **Least count of screw gauge is:**
(a) 0.1 cm (b) 0.01 mm (c) 0.001 cm (d) None of above

19. **Digital stopwatch used in laboratories can measure a time interval as small as:**
(a) $\frac{1}{10}$ sec (b) $\frac{1}{100}$ sec (c) $\frac{1}{1000}$ sec (d) $\frac{1}{100}$ sec

20. **Zero between two significant figures is considered as:**
(a) Natural numbers (b) Whole numbers
(c) Non-significant numbers (d) Significant numbers

21. **A body has translatory motion if it moves along a:**
(a) Straight line (b) Circle
(c) Line without rotation (d) Curved path

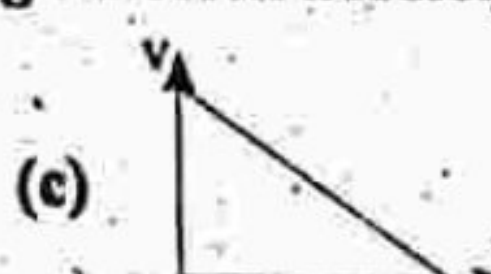
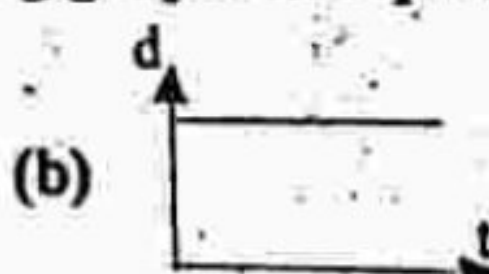
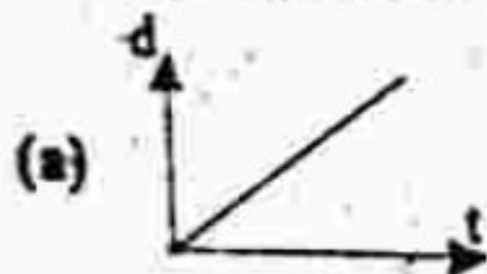
22. **The motion of a body about an axis is called:**
(a) Circular motion (b) Rotatory motion (c) Vibratory motion (d) Random motion

23. **Which of the following is a vector quantity?**
(a) Speed (b) Distance (c) Displacement (d) Power

24. **If an object is moving with constant speed then its distance-time graph will be a straight line.**
(a) Along time-axis (b) Along distance- axis
(c) Parallel to time-axis (d) Inclined to time-axis

25. **A straight line parallel to time-axis on a distance-time graph tells that the object is:**
(a) Moving with constant speed (b) At rest
(c) Moving with variable speed (d) In motion

26. **The speed-time graph of a car is shown in the figure, which of the following statement is true?**
(a) Car has an acceleration of $1.5ms^{-2}$ (b) Car has constant speed of $7.5ms^{-1}$
(c) Distance travelled by the car is 75m. (d) Average speed of the car is $15ms^{-1}$

27. **Which one of the following graphs is representing uniform acceleration?**
(a) (b) (c) (d)

28. **By dividing displacement of a moving body with time, we obtain:**
(a) Speed (b) Acceleration (c) Velocity (d) Deceleration

29. **A ball is thrown vertically upward. Its velocity at the highest point is:**
(a) $-10ms^{-1}$ (b) Zero (c) $10ms^{-2}$ (d) None of these

30. **A change in position is called:**
(a) Speed (b) Velocity (c) Displacement (d) Distance

31. **A train is moving at a speed of 36 kmh^{-1}. Its speed expressed in ms^{-1} is:**
(a) $10 ms^{-1}$ (b) $20ms^{-1}$ (c) $25ms^{-1}$ (d) $30ms^{-1}$

32. **A car starts from rest. It acquires a speed of $25ms^{-1}$ after 20s. The distance moved by the car during this time is:**
(a) 31.25m (b) 250 m (c) 500ms (d) 5000mp

33. **Study of motion of bodies without reference to the force and mass is called:**
(a) Dynamics (b) Kinematics (c) Mechanics (d) None of these

34. **Motion in which every particle of a body has exactly the same motion is called:**
(a) Rotatory motion (b) Vibratory motion
(c) Translatory motion (d) None of these

35. **A body repeats its motion again and again about a same point is called:**
(a) Translatory motion (b) Vibratory motion (c) Rotarory motion (d) None of these

36. **Distance covered in unit time is called:**
(a) Speed (b) Distance (c) Velocity (d) Displacement

37. **When velocity of a body changes in equal intervals of time then its acceleration is:**
(a) Average acceleration (b) Uniform acceleration
(c) Both (a) & (b) (d) None of these

38. **The spinning motion of a body about its axis is called:**
(a) Translatory motion (b) Vibratory motion (c) Rotatory motion (d) None of these

39. **A physical quantity which can be completely described by its magnitude is called:**
(a) vector (b) scalar (c) numerical (d) None of these

40. **The rate of change of velocity of a body is called:**
(a) uniform velocity (b) average velocity (c) acceleration (d) None of these

41. **Rate of displacement with respect to time is called:**
(a) speed (b) velocity (c) acceleration (d) position

42. **If a body covers equal displacement in equal interval of time is called:**
(a) uniform acceleration (b) displacement (c) uniform velocity (d) None of these

43. **Newton's first law of motion is valid only in the absence of:**
(a) Force (b) Net force (c) Friction (d) Momentum

44. **Inertia depends upon:**
(a) Force (b) Net force (c) Mass (d) Velocity

45. **A boy jumps out of a moving bus. There is a danger for him to fall:**
(a) Towards the moving bus (b) Away from the bus
(c) In the direction of motion (d) Opposite to the direction of motion

46. **A string is stretched by two equal and opposite forces 10N each. The tension in the string is:**
(a) Zero (b) 5N (c) 10N (d) 20N

47. **The mass of a body:**
(a) Decreases when accelerated (b) Increases when accelerated
(c) Decreases when moving with high velocity (d) None of these

48. **Two bodies of the m_1 and m_2 attached to the ends of an inextensible string passing over a frictionless pulley such that both move vertically. The acceleration of the bodies is:**
(a) $\frac{m_1 \times m_2}{m_1 + m_2}g$ (b) $\frac{m_1 - m_2}{m_1 + m_2}g$ (c) $\frac{m_1 + m_2}{m_1 - m_2}g$ (d) $\frac{2m_1m_2}{m_1 + m_2}g$

49. **Which of the following is the unit of momentum?**
(a) Nm (b) $kgms^{-2}$ (c) Ns (d) Ns^{-1}

50. **When horse pulls a cart, the action is on the:**
(a) Cart (b) Earth (c) Horse (d) Earth and cart

ANSWERS

1.	c	2.	b	3.	d	4.	c	5.	d	6.	b	7.	c

8.	c	9.	b	10.	c	11.	b	12.	c	13.	c	14.	d
15.	a	16.	b	17.	d	18.	c	19.	c	20.	d	21.	a
22.	b	23.	c	24.	c	25.	a	26.	a	27.	c	28.	c
29.	b	30.	d	31.	a	32.	b	33.	b	34.	c	35.	b
36.	a	37.	b	38.	c	39.	b	40.	c	41.	b	42.	c
43.	c	44.	c	45.	c	46.	d	47.	d	48.	b	49.	c
50.	d												

Test -II

1. **Which of the following material lowers friction when pushed between metal plates?**
(a) Water (b) Fine marble powder (c) Air (d) Oil

2. **Branch of physics that deals with study of motion of the object and cause of its motion is called:**
(a) Kinematics (b) Dynamics (c) Thermodynamics (d) None of these

3. **The relationship developed by Newton is between force and:**
(a) Acceleration (b) Motion (c) Speed (d) Velocity

4. **The property due to which the body feels resistance is:**
(a) Force (b) Power (c) Inertia (d) None of these

5. **Momentum of a body is quantity of motion. It possesses due to its mass and:**
(a) Acceleration (b) Velocity (c) Speed (d) None of these

6. **The first scientist to formulate the laws of motion is:**
(a) Galileo (b) Newton (c) Einstein (d) None of these

7. **First law of motion is also known as law of:**
(a) Motion (b) Rest (c) Inertia (d) Mass

8. **The mass of body is a measure of its:**
(a) Inertia (b) Weight (c) Acceleration (d) Rest

9. **Newton's second law of motion deals with situations when:**
(a) Net force is acting (b) Velocity is acting (c) Acceleration is acting (d) None of these

10. **If a force produces an acceleration "a" on mass "m" then this force is:**
(a) $F = ma$ (b) $F = ma^2$ (c) $F = m^2a^2$ (d) None of these

11. **Force produces an acceleration of $1ms^{-2}$ on mass 1kg is:**
(a) 1 Newton (b) 10 Newton (c) 0.1 Newton (d) None of these

12. **Two equal but unlike parallel forces having different line of action produce:**
(a) A torque (b) A couple (c) Equilibrium (d) Neutral equilibrium

13. **The number of forces that can be added by head to tail rule are:**
(a) 2 (b) 3 (c) 4 (d) Any number

14. **The number of perpendicular components of a force are:**
(a) 1 (b) 2 (c) 3 (d) 4

15. **A force of 10N is making an angle of 30° with the horizontal. Its horizontal component will be:**
(a) 4N (b) 5N (c) 7N (d) 8.7N

16. **A couple is formed by:**
(a) Two forces perpendicular to each other (b) Two like parallel forces
(c) Two equal and opposite forces not in the same line
(d) Two equal and opposite forces in the same line

17. **A body is in equilibrium when its:**
(a) Acceleration is uniform (b) Speed is uniform
(c) Speed and acceleration are uniform (d) Acceleration is zero

18. **Racing cars are made stable by:**
(a) Increasing their speed (b) Decreasing their mass
(c) Lowering their centre of gravity (d) Decreasing their width

19. **Forces that are parallel to each other and have same direction are called:**
(a) Parallel forces (b) Like parallel forces
(c) Unlike parallel forces (d) None of these

20. **Forces that are parallel to each other and have directions opposite to each other are called:**
(a) Parallel forces (b) Non-parallel forces
(c) Like parallel force (d) Unlike parallel forces

21. **A single force that has the same effect as combined effect of all the forces to be added is called:**
(a) Additional force (b) Final force (c) Resultant force (d) None of these

22. **Method for addition of forces by vector addition is:**
(a) Addition of vector (b) Mathematical addition
(c) Resultant addition (d) Head to tail method

23. **Splitting up of a force into two mutually perpendicular components is:**
(a) Resultant force (b) Addition of force
(c) Resolution of force (d) Subtraction of force

24. **The direction of force with x-axis is given by:**
(a) $\tan\theta = \frac{Fy}{Fx}$ (b) $\tan\theta = \frac{Fx}{Fy}$ (c) $\sin\theta = \frac{Fy}{Fx}$ (d) $\cos\theta = \frac{Fx}{Fy}$

25. **When two equal and opposite vectors are added their resultant is:**
(a) Doubled (b) Equal to them (c) Zero (d) None of these

26. **The line with arrow at its one end represents:**
(a) Head (b) Tail (c) Vector (d) All of these

27. **The mutually perpendicular lines are called:**
(a) Plane (b) Graph (c) Frame of reference (d) None of these

28. **A vector whose magnitude is equal but opposite in direction with another vector is:**
(a) Perpendicular (b) Negative (c) Addition (d) Resultant

29. **Earth's gravitational force of attraction vanishes at:**
(a) 6400 km (b) infinity (c) 42300km (d) 1000km

30. **Value of g increases with the:**
(a) Increase in mass of the body (b) Increase in altitude
(c) Decrease in altitude (d) None of the above

31. **The valve of g at a height one Earth's radius above the surface of the Earth is:**
(a) 2g (b) ½ g (c) ⅓ g (d) ¼ g

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32. **The value of g on moon's surface is $1.6ms^{-2}$. What will be the weight of a 100kg body on the surface of the moon?**
(a) 100N (b) 160N (c) 1000N (d) 1600N

33. **The altitude of geostationary orbits in which communication satellites are launched above the surface of the Earth is:**
(a) 850 km (b) 1000km (c) 6400km (d) 42,300km

34. **Everybody in the universe attracts other body with a force which is directly proportion at to their:**
(a) Weights (b) Masses (c) Density (d) None of these

35. **The gravitational force between the body of mass 'm' and earth is:**
(a) $F = G\frac{mM_e}{r^2}$ (b) $F = G\frac{M_e}{r^2}$ (c) $F = GmM_e$ (d) None of these

36. **The value of acceleration due to gravity "g" depends on earth's surface and its:**
(a) Mass (b) Diameter (c) Radius (d) None of these

37. **To keep moving satellite around the earth, there must be:**
(a) Centrifugal force (b) Force of gravity (c) Weight (d) Centripetal force

38. **The gravitational force per unit mass is called:**
(a) Earth's gravitation (b) Gravitational acceleration
(c) Gravitational field strength (d) None of these

39. **The weight equal to one earth radius above the surface of earth, "g" because**
(a) $\frac{1}{3}$ of its value on earth (b) $\frac{1}{4}$ of its value on earth
(c) $\frac{1}{2}$ of its value on earth (d) double the value on earth

40. **The unit of gravitational field strength is:**
(a) Nkg^{-1} (b) kgm^{-2} (c) Nkg (d) None of these

41. **Mass of earth is:**
(a) $6\times10^{-24}kg$ (b) $6\times10^{-24}kg$ (c) $6\times10^{-24}N/kg$ (d) None of these

42. **The first man who came up with the idea of gravity was:.**
(a) Elbert Einstien (b) Lord Rutherford (c) Isaac Newton (d) Man Planck

43. **The value of "g" is _______ to the square of radius of earth.**
(a) equals to (b) Universally proportional
(c) Directly proportional (d) None of these

44. **The work done will be zero when the angle between the force and the distance is:**
(a) 45° (b) 60° (c) 90° (d) 180°

45. **If the direction of motion of the force is perpendicular to the direction of motion of the body, then work done will be:**
(a) Maximum (b) Minimum (c) Zero (d) None of above

46. **If the velocity of a body becomes double, then its kinetic energy will:**
(a) Remain the same (b) Become double (c) Become four times (d) Become half

47. **The work done in lifting a brick of mass 2kg through a height of 5m above ground will be:**
(a) 2.5J (b) 10J (c) 50J (d) 100J

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48. The kinetic energy of a body of mass 2kg is 25J. Its speed is
(a) $5ms^{-1}$ (b) $12.5ms^{-1}$ (c) $25ms^{-1}$ (d) $50ms^{-1}$

49. Which one of the following converts light energy into electrical energy?
(a) Electric bulb (b) Electric generator (c) Photocell (d) Electric cell

50. When a body is lifted through a height h, the work done on it appears in the form of its:
(a) Kinetic energy (b) Potential energy
(c) Elastic potential energy (d) Geothermal energy

ANSWERS

1.	d	2.	b	3.	a	4.	c	5.	b	6.	b	7.	c
8.	a	9.	a	10.	a	11.	a	12.	b	13.	d	14.	b
15.	d	16.	c	17.	b	18.	c	19.	b	20.	d	21.	c
22.	d	23.	c	24.	a	25.	c	26.	c	27.	c	28.	b
29.	b	30.	c	31.	d	32.	b	33.	c	34.	b	35.	a
36.	c	37.	d	38.	c	39.	b	40.	a	41.	b	42.	c
43.	b	44.	c	45.	c	46.	c	47.	b	48.	a	49.	c
50.	b												

Test -III

1. The energy stored in coal is:
(a) Heat energy (b) Kinetic energy (c) Chemical energy (d) Nuclear energy

2. The energy stored in a dam is:
(a) Electric energy (b) Potential energy (c) Kinetic energy (d) Thermal energy

3. In Einstein's mass-energy equation, "c" is the:
(a) Speed of sound (b) Speed of light (c) Speed of electron (d) Speed of Earth

4. Rate of doing work is called:
(a) Energy (b) Torque (c) Power (d) Momentum

5. In which of the following state molecules do not leave their position?
(a) Solid (b) Liquid (c) Gas (d) Plasma

6. Which of the substances is the lightest one?
(a) Copper (b) Mercury (c) Aluminum (d) Lead

7. SI unit of pressure is Pascal, which is equal to:
(a) $10^4 Nm^{-2}$ (b) $1Nm^{-2}$ (c) $10^2 Nm^{-2}$ (d) $10^3 Nm^{-3}$

8. What should be the approximate length of a glass tube to construct a water barometer?
(a) 0.5m (b) 1m (c) 2.5m (d) 11m

9. According to Archimedes, upthrust is equal to:
(a) Weight of displaced liquid (b) Volume of displaced liquid
(c) Mass of displaced liquid (d) None of these

10. The density of a substance can be found with the help of:
(a) Pascal's law (b) Hooke's law
(c) Archimede principle (d) Principle of floatation

11. **The rate at which radiations are emitted depends upon:**
(a) Surface temperature (b) Environment temperature
(c) Matter temperature inside container (d) None of these

12. **Emission and absorption of radiation can be measured with:**
(a) Heat sensor (b) Thermometer (c) Leslie cube (d) None of these

13. **Land and sea breezes are the result of:**
(a) Conduction (b) Convection (c) Radiation (d) None of these

14. **Good conductors are used when ______ transfer of heat is required through body.**
(a) Slow (b) Medium (c) Fast (d) None of these

15. **Kinetic Molecular Theory is used to explain the:**
(a) Movement of particles (b) States of matter
(c) Mass of matter (d) None of these

16. **Plasma is the fourth state of matter in which gas is in:**
(a) Stable state (b) Stable state (c) Ionic state (d) None of these

17. **Density of substance is defined as its mass per unit:**
(a) Momentum (b) Volume (c) Area (d) Pressure

18. **When temperature of gas is increased, their kinetic energy will be.**
(a) Increased (b) Decreased (c) Unchanged (d) None of above

19. **An object is totally or partially immersed in liquid, an upthrust acts on it equal to ______ of liquid displaces.**
(a) Mass (b) Weight (c) Volume (d) None of these

20. **Stress is defined as:**
(a) $\frac{\text{Force}}{\text{volume}}$ (b) $\frac{\text{Force}}{\text{mass}}$ (c) $\frac{\text{Force}}{\text{Area}}$ (d) None of these

21. **If stress produces a change in the length of an object then it is called:**
(a) Strain (b) Total strain (c) Tensile strain (d) None of these

22. **The ratio of stress over strain is:**
(a) Greater than 1 (b) Less than 1 (c) Equals to 1 (d) Constant

23. **The ratio of stress to tensile strain is:**
(a) Strain (b) Tensile stress (c) Young's modulus (d) None of these

24. **SI unit of Young's modulus is:**
(a) Nm^2 (b) Nm^{-2} (c) N^2m^2 (d) N^2m^{-2}

25. **Water freezes at:**
(a) 0°F (b) 32°F (c) −273 K (d) 0 K

26. **Normal human body temperature is:**
(a) 15°C (b) 37°C (c) 37°F (d) 98.6°C

27. **Mercury is used as thermometric material because it has:**
(a) Uniform thermal expansion (b) Low freezing point
(c) Small heat capacity (d) All the above properties

28. **Which of the following material has large specific heat?**
(a) Copper (b) Ice (c) Water (d) Mercury

29. **Which of the following material has large value of temperature coefficient of linear expansion?**
(a) Aluminum (b) Gold (c) Brass (d) Steel

30. What will be the value of β for a solid for which has a value of $2\times10-5K^{-1}$.
(a) $2\times10^{-5}K^{-1}$ (b) $6\times10^{-5}K^{-1}$ (c) $8\times10^{-5}K^{-1}$ (d) $8\times10^{-5}K^{-1}$

31. A large water reservoir keeps the temperature of nearby land moderate due to:
(a) Low temperature of water (b) Low specific heat of water
(c) Less absorption of heat (d) Large specific heat of water

32. Which of the following affects evaporation?
(a) Temperature (b) Surface area of the liquid
(c) Wind (d) All of the above

33. The internal energy of the molecules of the body is:
(a) Its total kinetic energy. (b) Its total potential energy
(c) Sum of kinetic energy and potential energy (d) None of these

34. To convert the temperature from Celsius to Kelvin, formula is:
(a) T (K) = 273 + F (b) T (K) = 273 + C
(c) T (K) = 273 + F + C (d) None of these

35. Amount of heat required to raise the temperature of 1kg mass of the substance through 1 K is:
(a) Heat capacity (b) Heat absorption
(c) Heat dissipation (d) Specific heat capacity

36. Heat capacity is defined as:
(a) m^2c^2 (b) mc^2 (c) m^2c (d) mc

37. Latent heat of fusion of ice is:
(a) 3.36×10^5 J kg^{-1} (b) 33.6×10^5 J kg^{-1} (c) 0.36×10^5 Jkg^{-1} (d) 0.036×10^5 Jkg^{-1}

38. Latent heat of vaporization is defined as:
(a) $\Delta Q_v = m_v H_v^2$ (b) $\Delta Q_v = m Hv^2$ (c) $\Delta Q_v = mH_v$ (d) None of these

39. $\propto = \frac{\Delta L}{L_o \Delta T}$ is called
(a) Thermal absorption of a substance (b) Thermal expansion of a substance
(c) Linear thermal expansion of a substance (d) Volume thermal expansion of a substance

40. The coefficient of linear expansion and volume expansion are related by:
(a) $\beta = 3\propto$ (b) $\beta = 2\propto$ (c) $\beta = \frac{1}{2}\propto$ (d) $\beta = \frac{1}{3}\propto$

41. Real rate of volume expansion β_r is greater than the apparent rate of volume expansion β_a by an amount:
(a) $\beta_r = \beta_a + 2\beta_a$ (b) $\beta_r = \beta_a + \beta_a$ (c) $\beta_r = \beta_a + \beta_g$ (d) None of these

42. Changing of liquid into vapours without heating is:
(a) Condensation (b) Sublimation (c) Evaporation (d) Radiation

43. In solids, heat is transferred by:
(a) Radiation (b) Conduction (c) Convection (d) Absorption

44. What happens to the thermal conductivity of a wall if its thickness is doubled?
(a) Becomes double (b) Remains the same (c) Becomes half (d) Becomes one-fourth

45. Metals are good conductor of heat due to the:
(a) Free electrons (b) Big size of their molecules
(c) Small size of their molecules (d) Rapid vibrations of their atoms

46. **In gases, heat is mainly transferred by:**
    (a) Molecular collision (b) Conduction (c) Convection (d) Radiation

47. **Convection of heat is the process of heat transfer due to the:**
    (a) Random motion of molecules
    (b) Downward movement of molecules
    (c) Upward movement of molecules
    (d) Free movement of molecules

48. **False ceiling is done to:**
    (a) Lower the height of ceiling
    (b) Keep the roof clean
    (c) Cool the room
    (d) Insulate the ceiling

49. **Rooms are heated using gas heaters by:**
    (a) Conduction only
    (b) Convection and radiation
    (c) Radiation only
    (d) Convection only

50. **Land breeze blows from**
    (a) Sea to land during night
    (b) Sea to land during the day
    (c) Land to see during night
    (d) Land to sea during the day

ANSWERS

1.	c	2.	b	3.	b	4.	c	5.	a	6.	b	7.	b
8.	b	9.	a	10.	c	11.	a	12.	c	13.	b	14.	c
15.	b	16.	c	17.	c	18.	a	19.	c	20.	c	21.	c
22.	d	23.	c	24.	d	25.	c	26.	c	27.	d	28.	c
29.	a	30.	b	31.	d	32.	d	33.	c	34.	b	35.	d
36.	d	37.	a	38.	c	39.	c	40.	a	41.	c	42.	c
43.	b	44.	c	45.	a	46.	c	47.	c	48.	d	49.	d
50.	d												

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1 **Steroids are precursors of:**
(a) Progesterone (b) Estrogen (c) Testosterone (d) All

2 **Which disease is caused by under secretion of adrenal cortex?**
(a) Cretinism (b) Dwarfism (c) Sterility (d) Addison's disease

3 **Which hormone stimulates the secretion of milk?**
(a) Leutinising Hormone (b) Prolactin (c) Oxytocin (d) Progesterone

4 **Which one secretes "fright and flight" hormone?**
(a) Pituitary gland (b) Pineal gland (c) Adrenal gland (d) Thyroid gland

5 **When an animal is aggressive and attacks, the hormone responsible for it is:**
(a) Thyroxine (b) Testosterone (c) Adrenaline (d) ADH

6 **The set of hormones required for proper growth are:**
(a) Somatotropin, somatostatin and thyroxine
(b) Somatotropin, thyroxine and insulin
(c) Gonadotropin, somatostatin and thyroxine
(d) Adrenocorticotropins, somatotropin, somatostatin

7 **The growth rate in childhood is controlled by:**
(a) Thymosin (b) Testosterone (c) Oestrogen (d) Thyroxine

8 **Hormone was discovered by:**
(a) Funk (b) Albert Sabin (c) Starling (d) Addison

9 **Which of the following is one and the same thing:**
(a) Saliva: Pepsin (b) Adrenaline: nor-epinephrin
(c) Renin: Trypsin (d) Vasopressin: antidiuretic hormone

10 **Hormones used to induce lactation in cows is:**
(a) Oestrogen (b) Oxytocin (c) Progesterone (d) Relaxin

11 **A person who has bulging eyes, tachycardia and higher body temperature. He suffers from:**
(a) Hyperthyrodism (b) Diabetes (c) Acromegaly (d) Cretinism

12 **All hormones of the adrenal cortex are synthesized from:**
(a) Glycoproteins (b) Steroids (c) Cholesterol (d) None of these

13 **The hormone insulin is secreted by:**
(a) Pancreas (b) Liver (c) Kidney (d) Adrenal gland

14 **Chemically hormones are:**
(a) Proteins, steroids and biogenic amines (b) Proteins only
(c) Steroids only (d) Biogenic amines only

15 **It is a colourless plastid. It contains starch.**
(a) Leucoplast (b) Centrosome (c) Golgi Apparatus (d) Chloroplast

IMPORTANT SHORT QUESTIONS

Q.1. When light bends as it enters a different medium the process is known as what?
Ans. Refraction
Q.2. A magnifying glass is what type of lens?
Ans. Convex
Q.3. Electric resistance is typically measured in what units?
Ans. Ohms
Q.4. A person who studies physics is known as a?
Ans. Physicist
Q.5. Electric power is typically measured in what units?
Ans. Watts
Q.6. The most recognized model of how the universe begun is known as the?
Ans. Big bang
Q.7. Who is the Hubble Space Telescope named after?
Ans. Edwin Hubble
Q.8. Infrared light has a wavelength that is too long or short to be visible for humans?
Ans. Long
Q.9. What kind of eclipse do we have when the moon is between the sun and the earth?
Ans. A solar eclipse
Q.10. What is the earth's primary source of energy?
Ans. The sun
Q.11. Electric current is typically measured in what units?
Ans. Amperes
Q.12. What scientist is well known for his theory of relativity?
Ans. Albert Einstein
Q.13. Earth is located in which galaxy?
Ans. The Milky Way galaxy
Q.14. True or false? The boiling point of water is 100 degrees Celsius (212 degrees Fahrenheit).
Ans. True
Q.15. When water is cooled, does it expand or contract?
Ans. Expand
Q.16. Heat from the sun gets to the Earth by radiation, conduction or convention?
Ans. Radiation
Q.17. True or false? 100 Kelvin is the temperature of absolute zero.
Ans. False - 0 Kelvin

Q.18. Substances that don't conduct heat are known as what?
Ans. Insulators
Q.19. At what temperature is Fahrenheit equal to Centigrade?
Ans. -40 degrees
Q.20. Electric current is measured using what device?
Ans. Ammeter
Q.21. True or false? Batteries convert chemical to electrical energy.
Ans. True
Q.22. In terms of electricity, what does DC stand for?
Ans. Direct current
Q.23. True or false? The concept of electric fields was first introduced by Albert Einstein.
Ans. False (Michael Faraday)
Q.24. There are how many liters in a barrel
Ans. There are 159 litres
Q.25. How many joules are in a calorie?
Ans. 4 joules
Q.26. One pound is equal to______.
Ans. 453 grams
Q.27. One metric ton has ______ Kg
Ans. 1000 kg

Q.28. There are how many watts in a horsepower.
Ans. 746 watts
Q.29. Which is the strongest force of four fundamental forces?
Ans. Strong nuclear force
Q.30. Which is the weakest force of four fundamental forces?
Ans. Weak nuclear force
Q.31. True or false? Electric charge is a scalar quantity
Ans. True
Q.32. True or false? atmospheric pressure is scalar quantity
Ans. True
Q.33. What is the unit of weight?
Ans. Newton
Q.34. True or false? Weight of a body can be zero
Ans. True
Q.35. In food which kind of energy is stored
Ans. Chemical
Q.36. Thermal energy is kinetic or potential in nature?
Ans. Kinetic
Q.37. Thermocouple converts heat to which kind of energy?
Ans. Electric energy
Q.38. Einstein produced special theory of relativity in ______
Ans. 1905

Q.39. Einstein produced general theory of relativity in ______

Ans. 1915

Q.40. What is unit of charge?

Ans. Coulomb

Q.41. 1 kwh is equal to how many joules

Ans. 3.6 mega joules

Q.42. What is the voltage of electric supply provided by WAPDA?

Ans. 220 volts

Q.43. What is the frequency of electric supply provided by WAPDA?

Ans. 50 Hz

Q.44. Electric circuit in our home is parallel or series in nature

Ans. Parallel

Q.45. What is the unit of capacitance?

Ans. farad

Q.46. True or false? pure water is conductor of electricity

Ans. False

Q.47. Which element behaves as semiconductor?

Ans. Silicon and germanium

Q.48. True or false? N type semi conductor has more free electrons

Ans. True

Q.49. Which instrument is used to convert DC into AC

Ans. Inverter

Q.50. Which is the absolute scale of temperature?

Ans. Kelvin scale

Q.51. What is the body temperature in Kelvin?

Ans. 310.2 kelvin

Q.52. What is the lowest possible temperature on Fahrenheit scale?

Ans. -459.7°F.

Q.53. Which property of light is used in fiber optics?

Ans. Total internal reflection

Q.54. Rain bow represents which property of light?

Ans. dispersion

Q.55. In electromagnetic spectrum which kind of waves have highest wavelength?

Ans. Radio waves

Q.56. In electromagnetic spectrum, which kind of radiations has highest frequency?

Ans. Gamma rays

Q.57. Which of the following is converging mirror? Concave or convex.

Ans. Concave mirror

Q.58. Which of the concave or convex lens is convergent in nature?

Ans. Convex lens

Q.59. What is the speed of sound in water?

Ans. 1500 m/sec approximate

Q.60. True or false? Sound having high frequency will have high pitch and will be shrill sound.

Ans. True

Q.61. Yes or no? Cat voice has more pitch than the dog voice

Ans. Yes

Q.62. Who discovered radium and polonium

Ans. Marie Curie and Parie Curie

Q.63. Which is the most common isotope of uranium whose half life is 4500 million years

Ans. U-238

Q.64. What are poor metals

Ans. Tin and lead are very soft and weak metals therefore called poor metals

Q.65. What is the densest metal on surface of earth

Ans. Osmium metal is densest of all present on earth

Q.66. What is the non stick material that is used in non-stick pans

Ans. PTFE (polytetraflouroethylene)

Q.67. Which elements of periodic table are in liquid form at room temperature

Ans. Bromine and mercury

Q.68. What is the color of Neon light

Ans. Each noble gas produces a different color as Helium gives yellow light, neon gives reddish and argon gives blue light.

IMPORTANT TABLES

UNITS AND MEASUREMENTS

SI Units

Basic Physical Quantity	Unit	Symbol
Length	metre	m
Mass	kilogram	kg
Time	second	s
Temperature	kelvin	K
Electric current	ampere	A
Luminous intensity	candela	cd
Quantity of matter	mole	Mol

To assist the students following table is prepared and all the units of the respective quantities are clubbed together. It is easy to memorise.

Quantity	Units
Area	hectare and acre
Energy	joule, calories, kWh, electron volts, hp-hours, Btu, foot pound and erg
Length/distance	meter, foot, inch, yard, furlong, link, rod, chain, mile, fathom, fermi, angstrom, nautical mile, astronomical unit, parsec and light year
Mass	kilogram, metric tonnes (or ton), quintal, ounce, pound, stone and slug
Power	watt, kilowatt, horsepower
Pressure	atmosphere, bar, torr, pascal and mmHg
Volume	gallons, litre, pint, barrel, acre-foot and MAF
Force	newton and dyne
Magnetic Flux Density	gauss and tesla
Magnetic flux	maxwell and weber
Electrical conductance	siemens, mho and ampere volt
Radioactivity	curie, rutherford and becquerel
Radiation absorbed	gray, rem, sievert and rad

Note: *Measurement Units are always written with small letter.*

UNITS DEFINED & THEIR EQUIVALENCE

Unit	Definition/Explanation
acre	Traditional English land measure; 1 acre = 4,047 sq m or 43560 sq ft or 0.4047 hectare
hectare	Metric unit of area equal to 10,000 square metres (11,960 sq yds), or 2.47 acres.
acre-foot	Unit sometimes used to measure large volumes of water such as reservoirs; 1 acre-foot = 1,233.5 cu m or 43,560 cu ft
astronomical unit	Unit equal to the mean distance of the earth from the sun: 149,597,870 km or

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SETS & NUMBERS

1. A set is represented by a capital letter A, B, C, ..., Z of English alphabets and its member or elements are written within
   (a) brackets ( ) (b) brackets [ ]
   (c) brackets { } (d) none of these
2. Which mathematician gave the concept of sets in 19th century?
   (a) George Cantor (b) George Nicholas
   (c) George Adams (d) None of these
3. Which of the followings is a set of pets?
   (a) A = {cow, horse, goat.....}
   (b) A = {lion, horse, goat.....}
   (c) A = {cow, Tiger, goat.....}
   (d) A = {cow, horse, elephant.....}
4. Symbolically, we can write the members of the set A as Cow ∈ A is read as
   (a) Cow is a number of the set A
   (b) Cow is a base of the set A
   (c) Cow is an element of the set A
   (d) Cow is a set of the A
5. Which is the set of natural numbers?
   (a) N (b) W
   (c) E (d) P
6. Which is the set of whole numbers?
   (a) N (b) W
   (c) E (d) P
7. Which is the set of even numbers?
   (a) N (b) W
   (c) E (d) P
8. Which is the set of prime numbers?
   (a) N (b) W
   (c) E (d) P
9. Which is the set of odd numbers?
   (a) N (b) W
   (c) O (d) P
10. Which of the following statement is a set?
    (a) The five provinces of Pakistan
    (b) The geometrical instruments
    (c) The capital letters of the English alphabet
    (d) All of these
11. Which of the following statement is a set?
    (a) The players of Pakistan cricket team
    (b) The natural numbers less than 50
    (c) The whole numbers less than 9
    (d) All of these
12. Which of the following statement is not a set?
    (a) The sharp boys of a school.
    (b) The naughty boys of the street.
    (c) The difficult questions of a test.
    (d) All of these
13. Tabular form of a set is also known as
    (a) Roster form (b) Brackets form
    (c) Set form (d) None of these
14. A = {1,2,3,4,5,6}
    (a) The set of natural numbers less than 7
    (b) The set of whole numbers less than 100.
    (c) The set of four games
    (d) The set of all even numbers
15. B = {0,1,2,.......,99}
    (a) The set of natural numbers less than 7
    (b) The set of whole numbers less than 100
    (c) The set of four games
    (d) The set of all even numbers
16. C = {cricket, football, hockey, tennis}
    (a) The set of natural numbers less than 7
    (b) The set of whole numbers less than 100.
    (c) The set of four games
    (d) The set of all even numbers
17. E = {2,4,6,....}
    (a) The set of natural numbers less than 7
    (b) The set of whole numbers less than 100.
    (c) The set of four games
    (d) The set of all even numbers
18. F = {potato, ladyfinger, carrot, brinjal}
    (a) The set of four vegetables
    (b) The set of whole numbers less than 100.
    (c) The set of four games
    (d) The set of all even numbers
19. N = {1,2,3,.....}
    (a) The set of all natural numbers
    (b) The set of whole numbers less than 100.
    (c) The set of four games
    (d) The set of all even numbers
20. O = {1,3,5,.....}
    (a) The set of natural numbers less than 7
    (b) The set of whole numbers less than 100.

(c) The set of all even numbers
(d) The set of all odd numbers

21. W = {0, 1,2,3,......}
(a) The set of whole numbers
(b) The set of natural numbers less than 7
(c) The set of whole numbers less than 100.
(d) The set of all even numbers

22. {father, mother, brother, sister}
(a) The set of four family members
(b) The set of whole numbers less than 100
(c) The set of four games
(d) The set of all even numbers

23. *A set having a finite number of elements is called
(a) Finite set (b) Infinite set
(c) Prime Set (d) Odd Set

24. *A set whose elements are countable is called
(a) Finite set (b) Infinite set
(c) Prime Set (d) Odd Set

25. A set having unlimited number of elements is called
(a) Finite set (b) Infinite set
(c) Prime Set (d) Odd Set

26. The set of counting numbers is an example of
(a) Finite set (b) Infinite set
(c) Prime Set (d) Odd Set

27. The set of whole numbers is an example of
(a) Finite set (b) Infinite set
(c) Prime Set (d) Odd Set

28. The set of whole numbers
(a) W = {1,2,3,4,........}
(b) W = {1,2,3,4,.........100}
(c) W = {1,,3,5,7........}
(d) W = {0,1,2,3,4,........}

29. A set having a single element is called a
(a) Infinite set (b) Prime Set
(c) Odd Set (d) Singleton set

30. *A set having no element is known as an
(a) Empty set (b) Null set
(c) Odd Set (d) Both a & b

31. An empty set is denoted by the Greek letter ϕ, which is called
(a) Pai (b) Reg
(c) Red (d) Beta

32. The set of rivers in Pakistan.
(a) Finite set (b) Infinite set
(c) Empty set (d) Odd set

33. The set of all natural numbers
(a) finite set (b) Infinite set
(c) Empty set (d) Odd set

34. The set of number of people on the moon
(a) finite set (b) Infinite set
(c) Empty set (d) Odd set

35. A collection of distinct and well defined objects is called a
(a) Set (b) Thing
(c) Element (d) Atom

36. What is meant by the symbol .?
(a) It means "is the element of the set"
(b) It means Descriptive form of set
(c) It means tabular form of set
(d) None of these

37. Name the forms for describing a set.
(a) Descriptive form and tabular form
(b) Only Descriptive form
(c) Only tabular form
(d) None of these

38. One-to-one correspondence cannot be established between _____ sets.
(a) non-equivalent (b) well-defined
(c) Empty (d) Non-equivalent

39. ______ means a specific property of an object that enables it to be an element of a set or not.
(a) non-equivalent (b) well-defined
(c) Empty (d) Non-equivalent

40. The symbol ______ means does not belong to the set.
(a) $\subseteq$ (b) $\notin$
(c) ϕ (d) $\leftrightarrow$

41. ______ set is also known as null set.
(a) non-equivalent (b) well-defined
(c) Empty (d) Non-equivalent

42. The symbol is used for two ______ sets
(a) non-equivalent (b) well-defined
(c) Empty (d) Non-equivalent

43. To represent two equal sets, we use the symbol:
(a) $\leftrightarrow$ (b) $\subset$
(c) $\subseteq$ (d) $=$

44. To write an empty set, we use the symbol:
(a) $\in$ (b) $\subseteq$
(c) ϕ (d) $\leftrightarrow$

45. If A = {1,2,3} and B = {0,1,2,3,4}, then
(a) $A \subset B$ (b) $A = B$
(c) $A \subseteq B$ (d) $A \leftrightarrow B$

46. {11} is known as:
(a) Null set (b) singleton set
(c) subset (d) power set

47. To represent the equivalent sets, we use the symbol:
(a) ≈ (b) ∈
(c) ⊂ (d) ↔

48. The numbers ______ together with the natural numbers give us the whole numbers.
(a) 0 (b) 1
(c) 2 (d) 3

49. The numbers that we use for counting objects are called the _____ numbers.
(a) Natural (b) even
(c) Whole (d) Multiplicative

50. The numbers that can be divided by 2 are called _____ numbers.
(a) natural (b) even
(c) Whole (d) Multiplicative

51. To represent the set of _____ numbers we use the capital letter W.
(a) natural (b) even
(c) Whole (d) Multiplicative

52. The product of 1 and a whole number is always the whole number itself. Hence 1 is called the _____ identity.
(a) natural (b) even
(c) Whole (d) Multiplicative

53. The numbers that cannot be divided by 2 exactly are called:
(a) even numbers (b) natural numbers
(c) whole numbers (d) odd numbers

54. The smallest natural number is:
(a) 0 (b) 1
(c) 2 (d) 3

55. To represent the set of natural numbers, we use the capital letter,
(a) E (b) O
(c) N (d) W

56. The sum of two whole numbers is always:
(a) a prime number (b) an odd number
(c) an even number (d) a whole number

57. The symbols 1,2,3,4,5,6,7,8,9 are called.
(a) numerals (b) points
(c) signals (d) lines

58. The numbers 1,2,3, ... are called:
(a) whole numbers (b) natural numbers
(c) real numbers (d) rational numbers

59. Symbol of natural numbers is:
(a) R (b) W
(c) E (d) N

60. Counting number gives us:
(a) natural numbers (b) whole numbers
(c) real numbers (d) even numbers

61. Symbol of whole number is:
(a) N (b) O
(c) W (d) P

62. We represent whole numbers as:
(a) {0,1,2,3,...} (b) {0,1,2,3,4,...}
(c) {1,3,5,7,...} (d) {2,4,6,8,...}

63. Which of them is the smallest whole number?
(a) 0 (b) 1
(c) 2 (d) 3

64. Each number is one more than its previous number is called:
(a) predecessor (b) successor
(c) points (d) none of above

65. Each number is one less than its, next number is called:
(a) predecessor (b) successor
(c) points (d) none of above

66. Which of them is the successor of 0?
(a) 1 (b) 2
(c) 3 (d) 4

67. Which of them is the predecessor of 3?
(a) 1 (b) 2
(c) 3 (d) 4

68. > 7 but < 15 means:
(a) 7,8,9,10,11,12,13,14
(b) 8,9,10,11,12,13,14
(c) 8,9,10,11,12,13,14,15
(d) 7,8,9,10,11,12,13,14, 15

69. 5 + 6 = ______________
(a) 4 (b) 3
(c) 11 (d) 12

70. 15 < 3 means:
(a) 4,5,6 (b) 1,2,3
(c) 0,1,2 (d) 0,1,2,3

71. What is the sum of 90 and 60?
(a) 150 (b) 30
(c) 540 (d) 453

72. What is the subtraction of 842 and 391?
(a) 450 (b) 451
(b) 452 (d) 453

73. What is the subtraction of 2105 and 1726?
(a) 377 (b) 378
(c) 379 (d) 380

74. Which of them is the sum of 9056 and 8172?
(a) 17231 (b) 17230
(c) 17229 (d) 17228

75. Which of the sum of 634 and 179?

(a) 811 (b) 810
(c) 809 (d) 808

76. Commutative law means:
(a) 4 + 5 = 5 + 4 (b) 4 – 5 = 5 + 4
(c) 4 – 5 = 5 + 3 (d) None of above

77. 6 + 7 = 7 + 6 is known as:
(a) commutative law (b) associative law
(c) additive identity (d) none of above

78. 2 + (3+4) = (2+3) + 4 is known as:
(a) commutative law
(b) associative law
(c) additive identity
(d) none of above

79. 1 + 0 = ______
(a) 0 (b) 1
(c) 2 (d) 3

80. Which of them is known as additive identity?
(a) 0 (b) 1
(c) 2 (d) 3

81. Least common multiple of 24, 36, 54, 81 is:
(a) 642 (b) 644
(c) 646 (d) 648

82. The product of 74 and 23 is:
(a) 1700 (b) 1701
(c) 1702 (d) 1703

83. The product of 888 and 56 is:
(a) 49728 (b) 49729
(c) 49720 (d) 49727

84. The product of 22 and 22 is:
(a) 483 (b) 484
(c) 485 (d) 486

85. 27552 ÷ 112 = ______
(a) 244 (b) 245
(c) 246 (d) 247

86. What is the smallest 4-digit number which is exactly divisible by 135?
(a) 1086 (b) 1084
(c) 1082 (d) 1080

87. 2 × 3 = 3 × 2 is commutative law w.r.t.
(a) multiplication (b) addition
(c) subtraction (d) division

88. Commutative law w.r.t multiplication is:
(a) a+b = b+a (b) a×b = b×a
(c) a-b = b-a (d) a-b = b-d

89. Which of them is associative law?
(a) a × (b × c) = a × (a × b)
(b) (a × b) × c = a + (b + c)
(c) a + b = b + a
(d) a × b = b × a

90. 2 × (3 × 5) = 2 ×(3 × 5) = ______
(a) 29 (b) 30
(c) 31 (d) 32

91. Which of them is distributive law?
(a) a × (b × c) = (a × b) × c
(b) a × b = b × a
(c) a × (b + c) = ab + ac
(d) a – b = b – a

92. A × (b – c) = ab – ac is known as:
(a) distribution law over subtraction
(b) distribution law over addition
(c) distributive law over division
(d) distributive law over multiplicative

93. Which of the them is multiplicative identity?
(a) 0 (b) 1
(c) 2 (d) 3

94. 1 × 2 = 2 is known as:
(a) multiplicative identity
(b) addition identity
(c) subtraction identity
(d) division identity

95. The numbers having no common factor other than 1 are called ______ numbers.
(a) Co-prime (b) Composite
(c) Factorization (d) Odd

96. A number having a factor other than 1 and itself is called ______ number.
(a) Co-prime (b) Composite
(c) Factorization (d). Prime

97. ______ is the only even prime number.
(a) 0 (b) 1
(c) 2 (d) 3

98. A number is divisible by ______ if the digit at the units place is 0 or even number.
(a) 0 (b) 1
(c) 2 (d) 3

99. The process of writing a number into its factors is called ______.
(a) Co-prime (b) Composite
(c) Factorization (d) Prime

100. The factor of every number is:
(a) 0 (b) 1
(c) 2 (d) 3

101. Every number greater than 1 has at least factors:
(a) one (b) two
(c) three (d) four

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102. A number is divisible by 6 if it has even number at the unit place and the sum of its digits is divisible by:
 (a) 2 (b) 3
 (c) 6 (d) 9

103. The LCM of 2 and 3 is:
 (a) 2 (b) 3
 (c) 4 (d) 6

104. If the LCM of two numbers 4 and 9 is 36, then its HCF will be:
 (a) 1 (b) 2
 (c) 9 (d) 12

105. Factors of 18 are:
 (a) 1,2,3,4,6,9,18
 (b) 1,2,3,4,5,6,9, 18
 (c) 2,4,6,9,18
 (d) 1,3,4,5,7,9,18

106. Factor of 12 are:
 (a) 1,2,3,4,6 (b) 1,2,,3,4,6,12
 (c) 1,3,4,6,12 (d) 3,4,6,12

107. Multiple of 15 are:
 (a) 1,2,3,4,6 (b) 1,3,4,5,15
 (c) 1,3,5,15 (d) 3, 4, 5, 7, 15

108. Multiple of 2 are:
 (a) 1,2,3,4,5,6.... (b) 1,3,5,7.....
 (c) 2,4,6,8,10,..... (d) 2,3,5,7,.....

109. The numbers which are divisible by 2 called numbers:
 (a) even (b) odd
 (c) prime (d) composite

110. Set of even numbers is
 (a) {1,3,5,7,....} (b) E = {2,4,6,.....}
 (c) {2,3,5,7,.....} (d) {4,6,8,......}

111. The numbers which are not divisible by 2 called numbers:
 (a) even (b) composite
 (c) odd (d) prime

112. Set of odd numbers is:
 (a) {2,4,6,.....} (b) {1,3,5,7,.....}
 (c) {2,3,5,7,.....} (d) {4,6,8,.......}

113. A number having factors other than 1 and itself is called numbers.
 (a) even (b) odd
 (c) composite (d) prime

114. A number having exactly two factors, 1 and itself is called number.
 (a) even (b) odd
 (c) composite (d) prime

115. 1,2,4,7,8,14,28,56 are factors of:
 (a) 56 (b) 58
 (c) 60 (d) 65

116. 1,11,21 are factors of:
 (a) 125 (b) 121
 (c) 128 (d) 131

117. If the digits at the units place is 0,2,4,6 or 8. It is divisible by:
 (a) 2 (b) 3
 (c) 4 (d) 5

118. If the sum of its digits is divisible by 3 It is divisible by which:
 (a) 2 (b) 3
 (c) 4 (d) 5

119. If the digits at the units and tens places are 0's. it is divisible by:
 (a) 3 (b) 4
 (c) 5 (d) 6

ANSWERS

1. c	2. a	3. a	4. c	5. a	6. b	7. c	8. d	9. c	10 d
11. d	12. d	13. a	14. a	15. b	16. c	17. d	18. a	19. a	20 d
21. a	22. a	23. a	24. a	25. b	26. b	27. b	28. d	29. d	30 d
31. a	32. a	33. b	34. c	35. a	36. a	37. a	38. a	39 b	40 b
41. c	42. d	43. d	44. c	45. a	46. b	47. d	48 a	49 a	50 b
51. c	52. d	53. d	54. b	55. c	56. d	57. a	58 b	59 d	60 b
61. c	62. a	63. a	64. b	65. a	66. a	67. b	68. b	69 c	70 d
71. a	72. b	73. c	74. d	75. a	76. a	77. a	78 b	79 b	80 a
81. d	82. c	83. c	84. b	85 c	86. d	87 a	88 b	89 a	90 b
91. c	92. a	93. b	94. a	95. a	96. b	97. c	98. c	99 c	100 b
101. b	102. b	103. d	104. a	105. a	106. b	107 c	108. b	109 a	110 b
111 c	112. b	113. c	114. d	115. a	116. b	117. a	118 b	119. c	

BASIC ALGEBRA

ALGEBRAIC EXPRESSIONS

In algebra, following terms are very important.

Monomial: A monomial is any number or variable or product of numbers and variables. Each of the following is a monomial. 3, –4, x, y, $3x$, $-4xyz$, $5x^3$, $1.5xy^2$, a^3b^4.

Polynomial: A polynomial is a monomial or the sum of two or more polynomial is called a term polynomial. Each of the following is a polynomial:

$2x^2$, $2x^2+3$, $3x^2-7$, x^2+5x-1

a^2b+b^2a, x^2-y^2, w^2-2w+1

Some Basic Formulae:

$(a+b)(a-b)=(a^2-b^2)$

$(a+b)^2=(a^2+b^2+2ab)$

$(a-b)^2=(a^2+b^2-2ab)$

$(a+b+c)^2=a^2+b^2+c^2+2(ab+bc+ca)$

$(a^3+b^3)=(a+b)(a^2-ab+b^2)$

$(a^3-b^3)=(a-b)(a^2+ab+b^2)$

$(a^3+b^3+c^3-3abc)=(a+b+c)(a^2+b^2+c^2-ab-bc-ac)$

When $a+b+c=0$, then $a^3+b^3+c^3=3abc$.

EXERCISE

1. What is the value of $-3a^2b$ when $a=-4$ and $b=0.5$?
   (a) –70 (b) –58 (c) –24 (d) –48
2. If $a-b=7$ and $a+b=13$, What is the value of a^2-b^2?
   (a) 91 (b) –120 (c) 100 (d) 108
3. If $x^2+y^2=36$ and $(x+y)^2=4$, what is the value of xy?
   (a) 10 (b) 14 (c) 28 (d) 99
4. What is the value of $\frac{a^2-b^2}{a-b}$ when $a=117$ and $b=118$?
   (a) 235 (b) 252 (c) 257 (d) 282
5. What is the average arithmetic mean of x^2+2x-3, $3x^2-2x-3$, and $30-4x^2$?
   (a) –12 (b) 17 (c) 8 (d) $\frac{x^2+15}{2}$
6. What is the value of $x^2+12x+36$ when $x=994$?
   (a) 1,00,0000 (b) 98098 (c) 11926 (d) 82900
7. If $c^2+d^2=4$ and $(c-d)^2=2$, what is the value of cd?
   (a) $\sqrt{2}$ (b) 1 (c) $\sqrt{3}$ (d) 5

8. What is the value of $(2x + 3)(x + 6) - (2x - 5)(x + 10)$?
   (a) 50 (b) 56 (c) 68 (d) 88

9. If $\frac{1}{a} + \frac{1}{b} = \frac{1}{c}$ and $ab = c$, what is the average of a and b?
   (a) 0 (b) $\frac{1}{2}$ (c) 3 (d) $\frac{4}{5}$

10. If $x^2 - y^2 = 28$ and $x - y = 8$, what is the average of x and y?
   (a) 1.75 (b) 3.5 (c) 8.5 (d) 2.7

11. Which of the following is equal to $\left[\frac{1}{a} + a\right]^2 - \left[\frac{1}{a} - a\right]^2 = ?$
   (a) 1 (b) 4 (c) $\frac{2}{5}$ (d) $2a^2$

12. If $\left[\frac{1}{a} + a\right]^2 = 100$, what is the value of $\frac{1}{a^2} + a^2$?
   (a) 72 (b) 78 (c) 98 (d) 112

ANSWERS AND EXPLANATIONS

1. Answer (c)

Evaluate: $-3(-4)^2(0.5) = -3(16)(0.5) = -24$

2. Answer (a)

$a^2 - b^2 = (a + b)(a - b) = (7)(13) = 91$

3. Answer (b)

$2xy = 64 - 36 = 28 \Rightarrow xy = 14$

4. Answer (a)

$\frac{a^2 - b^2}{a - b} = \frac{(a - b)(a + b)}{(a - b)} = a + b = 117 + 118 = 235$

5. Answer (c)

To find the average, take the sum of three polynomials

and then divide by 3.

There sum is $(x^3 + 2x - 3) + (3x^2 - 2x - 3) + (30 - 4x^2) = 24$. and $24 \div 3 = 8$

6. Answer (a)

You can avoid messy, time consuming arithmetic if you recognise that $x^2 + 12x + 36 = (x + 6)^2$.

7. Answer (b)

Start by squaring $c - d$:

$2 = (c - d)^2 = c^2 - 2cd + d^2 = c^2 + d^2 - 2cd = 4 - 2cd$

So, $2 = 4 - 2cd \Rightarrow cd = 1$

8. Answer (c)

First multiply out both pairs of binomials.

$(2x + 3)(x + 6) = 2x^2 + 15x + 8$ and

$(2x - 5)(x + 10) = 2x^2 + 15x - 50$

Now subtract

$(2x^2 + 15x + 18) - (2x^2 + 15x - 50) = 18 - (-50) = 68$

9. Answer (b)

$\frac{1}{c} = \frac{1}{a} + \frac{1}{b} = \frac{a + b}{ab} = \frac{a + b}{c} \Rightarrow 1 = a + b \Rightarrow \; = \frac{1}{2}$

10. Answer (a)

$x^2 - y^2 = (x - y)(x + y) \Rightarrow 28 = 8(x + y)$

$\Rightarrow x + y = 28 \div 8 = 3.5.$

Finally, the average of x and y is $\frac{x + y}{2} = \frac{3.5}{2} = 1.75$

11. Answer (b)

Expand each square:

$\left(\frac{1}{a} + a\right)^2 = \frac{1}{a^2} + 2\left(\frac{1}{a}\right)(a) + a^2 = \frac{1}{a^2} + 2 + a^2$

Similarly, $\left(\frac{1}{a}-a\right)^2 = \frac{1}{a^2} + 2a^2.$

Subtract: $\left(\frac{1}{a^2}+2+a^2\right)-\left(\frac{1}{a^2}-2+a^2\right)=4$

12. Answer (c)

$100 = \left(\frac{1}{a}+a\right)^2 = \frac{1}{a^2}+2+a^2 \Rightarrow \frac{1}{a^2}+a^2 = 98$

PROBLEMS ON NUMBERS

EXERCISE

1. If one-third of one-fourth of a number is 15, then three-tenth of that number is:
   (a) 22 (b) 39 (c) 47 (d) 54
2. Three times the first of three consecutive odd integers is 3 more than twice the third. The third integer is:
   (a) 2 (b) 7 (c) 9 (d) 15
3. The difference between a two-digit number and the number obtained by interchanging the positions of its digits is 36. What is the difference between the two digits of that number?
   (a) 2 (b) 4 (c) 7 (d) 15
4. The difference between a two-digit number and the number obtained by interchanging the digits is 36. What is the difference between the sum and the difference of the digits of the number if the ratio between the digits of the number is 1 : 2 ?
   (a) 3 (b) 8 (c) 13 (d) 16
5. A two-digit number is such that the product of the digits is 8. When 18 is added to the number, then the digits are reversed. The number is:
   (a) 10 (b) 24 (c) 38 (d) 98
6. The sum of the digits of a two-digit number is 15 and the difference between the digits is 3. What is the two-digit number?
   (a) 50 (b) 55 (c) 92 (d) Cannot be determined
7. The sum of the squares of three numbers is 138, while the sum of their products taken two at a time is 131. Their sum is:
   (a) 20 (b) 25 (c) 35 (d) 40
8. A number consists of two digits. If the digits interchange places and the new number is added to the original number, then the resulting number will be divisible by:
   (a) 5 (b) 7 (c) 10 (d) 11
9. In a two-digit, if it is known that its unit's digit exceeds its ten's digit by 2 and that the product of the given number and the sum of its digits is equal to 144, then the number is:
   (a) 24 (b) 28 (c) 30 (d) 33
10. Find a positive number which when increased by 17 is equal to 60 times the reciprocal of the number.
    (a) 3 (b) 7 (c) 12 (d) 15
11. The product of two numbers is 9375 and the quotient, when the larger one is divided by the smaller, is 15. The sum of the numbers is:
    (a) 310 (b) 350 (c) 400 (d) 476
12. The product of two numbers is 120 and the sum of their squares is 289. The sum of the number is:
    (a) 18 (b) 23 (c) 30 (d) 33
13. A number consists of 3 digits whose sum is 10. The middle digit is equal to the sum of the other two and the number will be increased by 99 if its digits are reversed. The number is:
    (a) 210 (b) 253 (c) 280 (d) 285
14. The sum of two number is 25 and their difference is 13. Find their product.
    (a) 100 (b) 114 (c) 125 (d) 186
15. What is the sum of two consecutive even numbers, the difference of whose squares is 84?
    (a) 28 (b) 33 (c) 42 (d) 50

ANSWERS AND EXPLANATIONS

1. Answer (d)
Let the number be x.
Then, $\frac{1}{3}$ of $\frac{1}{4}$ of $x = 15 \Leftrightarrow x = 15 \times 12 = 180$.
So, required number $= \left(\frac{3}{10} \times 180\right) = 54$

2. Answer (d)
Let the three integers be x, $x+2$ and $x+4$.
Then, $3x = 2(x+4) + 3 \Leftrightarrow x = 11$.
$\therefore$ Third integer $= x + 4 = 15$.

3. Answer (b)
Let the ten's digit be x and unit's digit be y.
Then, $(10x+y) - (10y+x) = 36$
$\Rightarrow 9(x-y) = 36$
$\Rightarrow x-y = 4$.

4. Answer (b)
Since the number is greater than the number obtained on reversing the digits, so the ten's digit is greater than the unit's digit.
Let ten's and unit's digits be $2x$ and x respectively.
Then, $(10 \times 2x + x) - (10x + 2x) = 36$
$\Rightarrow 9x = 36$
$\Rightarrow x = 4$.
$\therefore$ Required difference $= (2x+x) - (2x-x) = 2x = 8$.

5. Answer (b)
Let the ten's and unit digit be x and $\frac{8}{x}$ respectively.
Then, $\left(10x + \frac{8}{x}\right) + 18 = 10 \times \frac{8}{x} + x$
$\Rightarrow 10x^2 + 8 + 18x = 80 + x^2$
$\Rightarrow 9x^2 + 18x - 72 = 0$
$\Rightarrow x^2 + 2x - 8 = 0$
$\Rightarrow (x+4)(x-2) = 0$
$\Rightarrow x = 2$.

6. Answer (d)
Let the ten's digit be x and unit's digit be y.
Then, $x+y = 15$ and $x-y = 3$ or $y-x = 3$.
Solving $x+y = 15$ and $x-y = 3$, we get: $x = 9, y = 6$.
Solving $x+y = 15$ and $y-x = 3$, we get: $x = 6, y = 9$.
So, the number is either 96 or 69.
Hence, the number cannot be determined.

7. Answer (a)
Let the numbers be a, b and c.
Then, $a^2+b^2+c^2 = 138$ and $(ab+bc+ca) = 131$.
$(a+b+c)^2 = a^2+b^2+c^2 + 2(ab+bc+ca) = 138 + 2 \times 131$
$= 400$.
$\Rightarrow a+b+c = 20$.

8. Answer (d)
Let the ten's digit be x and unit's digit be y.
Then, number $= 10x+y$.
Number obtained by interchanging the digits $= 10y+x$.
$\therefore (10x+y) + (10y+x) = 11(x+y)$, which is divisible by 11.

9. Answer (a)
Let the ten's digit be x.
Then, unit's digit $= x+2$.
Number $= 10x + (x+2) = 11x + 2$.
Sum of digits $= x + (x+2) = 2x + 2$.
$\therefore (11x+2)(2x+2) = 144$
$\Rightarrow 22x^2 + 26x - 140 = 0$
$\Rightarrow 11x^2 + 13x - 70 = 0$
$\Rightarrow (x-2)(11x+35) = 0$
$\Rightarrow x = 2$.
Hence, required number $= 11x + 2 = 24$.

10. Answer (a)
Let the number be x.
Then, $x + 17 = \frac{60}{x}$
$\Rightarrow x^2 + 17x - 60 = 0$
$\Rightarrow (x+20)(x-3) = 0$
$\Rightarrow x = 3$.

11. Answer (c)
Let the numbers be x and y.
Then, $xy = 9375$ and $\frac{x}{y} = 15$.
$\frac{xy}{(x/y)} = \frac{9375}{15}$
$\Rightarrow y^2 = 625$.
$\Rightarrow y = 25$.
$\Rightarrow x = 15y = (15 \times 25) = 375$.
$\therefore$ Sum of the numbers $= x + y = 375 + 25 = 400$.

12. Answer (b)
Let the numbers be x and y.
Then, $xy = 120$ and $x^2+y^2 = 289$.
$\therefore (x+y)^2 = x^2+y^2 + 2xy = 289 + (2 \times 120) = 529$
$\therefore x+y = 23$.

13. Answer (b)
Let the middle digit be x.
Then, $2x = 10$ or $x = 5$.
So, the number is either 253 or 352.
Since the number increases on reversing the digits, so the hundred's digits is smaller than the unit's digit.
Hence, required number = 253.

14. Answer (b)
Let the numbers be x and y.

Then, $x+y = 25$ and $x-y = 13$.
$4xy = (x+y)^2 - (x-y)^2$
$= (25)^2 - (13)^2$
$= (625 - 169)$
$= 456$
$\therefore \quad xy = 114.$

15. Answer (c)

Let the numbers be x and $x+2$.
Then, $(x+2)^2 - x^2 = 84$
$\Rightarrow \quad 4x + 4 = 84$
$\Rightarrow \quad 4x = 80$
$\Rightarrow \quad x = 20.$
$\therefore \quad$ The required sum $= x + (x+2) = 2x + 2 = 42.$

RATIO AND PROPORTION

1. Ratio:

The ratio of two quantities *a* and *b* in the same units, is the fraction $\frac{a}{b}$ and we write it as $a : b$. In the ratio $a : b$, we call *a* as the first term or **antecedent** and b, the second term or **consequent**.

Eg. The ratio 5 : 9 represents - with antecedent = 5, consequent = 9.

Rule: The multiplication or division of each term of a ratio by the same non-zero number does not affect the ratio.

Eg. 4 : 5 = 8 : 10 = 12 : 15. Also, 4 : 6 = 2 : 3.

2. Proportion:

The equality of two ratios is called proportion. If $a : b = c : d$, we write $a : b :: c : d$ and we say that *a, b, c, d* are in proportion. Here *a* and *d* are called **extremes**, while *b* and *c* are called **mean terms**. Product of means = Product of extremes.

Thus, $a : b :: c : d \Leftrightarrow (b \times c) = (a \times d)$.

EXERCISE

1. A and B together have Rs. 1210. If $\frac{4}{15}$ of A's amount is equal to $\frac{2}{5}$ of B's amount, how much amount does B have?

   (a) Rs. 470 (b) Rs. 484 (c) Rs. 510 (d) Rs. 515

2. For every 50 rupees note Ali gives to Ahmed, he gives him back five 10 rupees notes. Ahmed gave Ali thirty-five 10 rupees notes. How many 50 rupees notes did Ali give him?

   (a) 4 (b) 5 (c) 6 (d) 7

3. Two numbers are respectively 20% and 50% more than a third number. The ratio of the two numbers is:

   (a) 1 : 5 (b) 2 : 5 (c) 4 : 5 (d) 5 : 8

4. A sum of money is to be distributed among A, B, C, D in the proportion of 5 : 2 : 4 : 3. If C gets Rs. 1000 more than D, what is B's share?

   (a) Rs. 1600 (b) Rs. 1800 (c) Rs. 2000 (d) Rs. 2500

5. Seats for Mathematics, Physics and Biology in a school are in the ratio 5 : 7 : 8. There is a proposal to increase these seats by 40%, 50% and 75% respectively. What will be the ratio of increased seats?

   (a) 2 : 3 : 4 (b) 6 : 8 : 7 (c) 6 : 7 : 8 (d) 7 : 8 : 9

6. A Jar contains blue and red marbles, 20 in all. Each of the following can be in the ratio of blue to red marbles Except

   (a) 1:1 (b) 3:2 (c) 4:1 (d) 5:1

7. In a mixture 60 litres, the ratio of milk and water 2 : 1. If the this ratio is to be 1 : 2, then the quantity of water to be further added is:

(a) 30 litres (b) 35 litres (c) 50 litres (d) 60 litres

8. A wire of uniform density and composition weighs 16 kg. It is cut into 2 pieces. One is 30 feet and 12 kg. What is the length of the original piece?

(a) 36 (b) 40 (c) 42 (d) 44

9. The ratio of the number of boys and girls in a college is 7 : 8. If the percentage increase in the number of boys and girls be 20% and 10% respectively, what will be the new ratio?

(a) 10 : 12 (b) 13 : 15 (c) 21 : 22 (d) 24 : 25

10. Salaries of Rani and Sohail are in the ratio 2 : 3. If the salary of each is increased by Rs. 4000, the new ratio becomes 40 : 57. What is Sohail's salary?

(a) Rs. 15,000 (b) Rs. 18,000 (c) Rs. 27,000 (d) Rs. 38,000

11. If 0.75 : x :: 5 : 8, then x is equal to:

(a) 1.14 (b) 1.20 (c) 1.18 (d) 1.25

12. The sum of three numbers is 98. If the ratio of the first to second is 2 :3 and that of the second to the third is 5 : 8, then the second number is:

(a) 25 (b) 30 (c) 35 (d) 40

13. If Rs. 782 be divided into three parts, proportional to $\frac{1}{2}:\frac{2}{3}:\frac{3}{4}$, then the first part is:

(a) Rs. 170 (b) Rs. 180 (c) Rs. 198 (d) Rs. 204

14. The salaries A, B, C are in the ratio 2 : 3 : 5. If the increments of 15%, 10% and 20% are allowed respectively in their salaries, then what will be new ratio of their salaries?

(a) 2 : 3 : 4 : 8 (b) 6 : 7 : 8 (c) 23 : 33 : 60 (d) 15 : 10

15. If 40% of a number is equal to two-third of another number, what is the ratio of first number to the second number?

(a) 1 : 4 (b) 2 : 5 (c) 5 : 3 (d) 5 : 7

16. Two number are in the ratio 3 : 5. If 9 is subtracted from each, the new numbers are in the ratio 12 : 23. The smaller number is:

(a) 25 (b) 33 (c) 38 (d) 45

17. In a bag, there are coins of 25 p, 10 p and 5 p in the ratio of 1 : 2 : 3. If there is Rs. 30 in all, how many 5 p coins are there?

(a) 80 (b) 95 (c) 150 (d) 180

18. A flagstaff 17.5 m high casts a shadow of length 40.25 m. The height of the building, which casts a shadow of length 28.75 m under similar conditions will be:

(a) 8.75 m (b) 12.5 m (c) 15.25 m (d) 20.20 m

19. If 7 spiders make 7 webs in 7 days, then 1 spider will make 1 web in how many days?

(a) 3 (b) 5 (c) 7 (d) 21

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20. 39 persons can repair a road in 12 days, working 5 hours a day. In how many days will 30 persons, working 6 hours a day, complete the work?
(a) 8 (b) 13 (c) 17 (d) 20

Answers and Explanations

1. **Answer: (b)**

$\frac{4}{15}A = \frac{2}{5}B$

$\Rightarrow A = \left(\frac{2}{5} \times \frac{15}{4}\right)B$

$\Rightarrow A = \frac{3}{2}B$

$\Rightarrow \frac{A}{B} = \frac{3}{2}$

$\Rightarrow A : B = 3 : 2.$

$\therefore$ B's share = Rs. $\left(1210 \times \frac{2}{5}\right)$ = Rs. 484.

2. **Answer: (d)**

(Ali / Ahmed) = (1 / 5), let x be number of 50 rupees notes

So $(x / 35) = (1 / 5) \Rightarrow x = 7$

3. **Answer:(c)**

Let the third number be x.

Then, first number = 120% of $x = \frac{120x}{100} = \frac{6x}{5}$

Second number = 150% of $x = \frac{150x}{100} = \frac{3x}{2}$

$\therefore$ Ratio of first two numbers = $\left(\frac{6x}{5} : \frac{3x}{2}\right) = 12x : 15x$

$= 4 : 5$

4. **Answer:(c)**

Let the shares of A, B, C and D be Rs. 5x, Rs. 2x, Rs. 4xand Rs. 3xrespectively.

Then, $4x - 3x = 1000$

$\Rightarrow x = 1000.$

$\therefore$ B's share = Rs. 2x= Rs. (2 x 1000) = Rs. 2000.

5. **Answer:(a)**

Originally, let the number of seats for Mathematics, Physics and Biology be 5x, 7xand 8x respectively.

Number of increased seats are (140% of 5x), (150% of 7x) and (175% of 8x).

$\Rightarrow \left(\frac{140}{100} \times 5x\right) ; \left(\frac{50}{100} \times 7x\right)$ and $\left(\frac{175}{100} \times 8x\right)$

$\Rightarrow 7x, \frac{21x}{2}$ and $14x.$

$\therefore$ The required ration = $7x : \frac{21x}{2} : 14x$

$\Rightarrow 14x : 21x : 28x$

$\Rightarrow 2 : 3 : 4.$

6. **Answer: (d)**

all ratios are possible except 5:1 because the sum of 5 + 1 = 6 which cannot be used to divide 20

7. **Answer: (d)**

Quantity of milk = $\left(60 \times \frac{2}{3}\right)$ litres = 40 litres.

Quantity of water in it = (60- 40) litres = 20 litres.

New ratio = 1 : 2

Let quantity of water to be added further be x litres.

Then, milk : water = $\left(\frac{40}{20 + x}\right)$.

Now, $\left(\frac{40}{20 + x}\right) = \frac{1}{2}$

$\Rightarrow 20 + x = 80$

$\Rightarrow x = 60.$

$\Rightarrow$ Quantity of water to be added = 60 litres.

8. **Answer: (b)**

Let x be the length of the original piece.

So $(x / 16) = (30 / 12) \Rightarrow x = 40$

9. **Answer: (c)**

Originally, let the number of boys and girls in the college be $7x$ and $8x$ respectively.

Their increased number is (120% of $7x$) and (110% of $8x$).

$\Rightarrow \left(\frac{120}{100} \times 7x\right)$ and $\left(\frac{110}{100} \times 8x\right)$

$\Rightarrow \frac{42x}{5}$ and $\frac{44x}{5}$

$\therefore$ The required ration = $\left(\frac{42x}{5} : \frac{44x}{5}\right) = 21 : 22.$

10. **Answer: (d)**

Let the original salaries of Rani and Sohail be Rs. $2x$ and Rs. $3x$ respectively.

Then, $\frac{2x+4000}{3x+4000} = \frac{40}{57}$

$\Rightarrow$ $57(2x+4000) = 40(3x+4000)$

$\Rightarrow$ $6x = 68,000$

$\Rightarrow$ $3x = 34,000$

Sohail's present salary = $(3x + 4000)$ = Rs.(34000 + 4000)

= Rs. 38,000.

11. Answer: (b)

$(x \times 5) = (0.75 \times 8) \Rightarrow x = \left(\frac{6}{5}\right) = 1.20$

12 Answer:(b)

Let the three parts be A, B, C. Then,

$A : B = 2 : 3$ and $B : C = 5 : 8 = \left(5 \times \frac{3}{5}\right) : \left(8 \times \frac{3}{5}\right) = 3 : \frac{24}{5}$

$\Rightarrow$ $A : B : C = 2 : 3 \frac{24}{5} = 10 : 15 : 24$

$\Rightarrow$ $B = \left(98 \times \frac{15}{49}\right) = 30.$

13. Answer: (d)

Given ratio $= \frac{1}{2} : \frac{2}{3} : \frac{3}{4} = 6 : 8 : 9.$

$\therefore$ 1st part = Rs. $\left(782 \times \frac{6}{23}\right)$ = Rs. 204

14. Answer: (c)

Let $A = 2k$, $B = 3k$ and $C = 5k$.

A's new salary $= \frac{115}{100}$ of $2k = \left(\frac{115}{100} \times 2k\right) = \frac{23k}{10}$

B's new salary $= \frac{110}{100}$ of $3k = \left(\frac{110}{100} \times 3k\right) = \frac{33k}{10}$

C's new salary $= \frac{120}{100}$ of $5k = \left(\frac{120}{100} \times 5k\right) = 6k$

$\therefore$ New ratio $\left(\frac{23k}{10} : \frac{33k}{10} : 6k\right) = 23 : 33 : 60$

15. Answer: (c)

Let 40% of $A = \frac{2}{3}B$

Then, $\frac{40A}{100} = \frac{B}{3}$

$\Rightarrow$ $\frac{2A}{5} = \frac{B}{3}$

$\Rightarrow$ $\frac{A}{B} = \left(\frac{2}{3} \times \frac{5}{2}\right) = \frac{5}{3}$

$\therefore$ $A : B = 5 : 3.$

16. Answer: (b)

Let the numbers be $3x$ and $5x$.

Then, $\frac{3x-9}{5x-9} = \frac{12}{23}$

$\Rightarrow$ $23(3x-9) = 12(5x-9)$

$\Rightarrow$ $9x = 99$

$\Rightarrow$ $x = 11.$

$\therefore$ The smaller number = $(3 \times 11) = 33.$

17. Answer: (c)

Let the number of 25 p, 10 p and 5 p coins be x, $2x$, $3x$ respectively.

Then, sum of their value = Rs. $\left(\frac{25x}{100} + \frac{10 \times 2x}{100} + \frac{5 \times 3x}{100}\right)$

= Rs. $\frac{60x}{100}$

$\therefore$ $\frac{60x}{100} = 30 \Leftrightarrow x = \frac{30 \times 100}{60} = 50.$

Hence, the number of 5 p coins = $(3 \times 50) = 150.$

18. Answer (b)

Let the height of the building x metres.

$\therefore$ $40.25 : 28.75 :: 17.5 : x$

$\Leftrightarrow$ $40.25 \times x = 28.75 \times 17.5$

$x = \frac{28.75 \times 17.5}{40.25} = 12.5$

19. Answer (c)

Let the required number days be x.

$$\left.\begin{array}{ll}\text{Spiders} & 1 : 7 \\ \text{Webs} & 7 : 1\end{array}\right\} :: 7 : x$$

$\therefore$ $1 \times 7 \times x = 7 \times 1 \times 7$

$\Rightarrow$ $x = 7.$

20. Answer (b)

Let the required number of days be x.

$$\left.\begin{array}{ll}\text{Persons} & 30 : 39 \\ \text{Working hours/day} & 6 : 5\end{array}\right\} :: 12 : x$$

$\therefore$ $30 \times 6 \times x = 39 \times 5 \times 12$

$\Rightarrow$ $x = \frac{(39 \times 5 \times 12)}{(30 \times 6)}$

$\Rightarrow$ $x = 13.$

EQUATIONS AND INEQUALITIES

- The basic principle that you must adhere to in solving any equation is that you can manipulate it in any way,

as long as you do the same thing to both sides. For example, you may always add the same number to each side, subtract the some number from each side, multiply or divide each side by the same number take the square of each side or take the reciprocal of each side. These comments apply to inequalities as well, except you must be careful, because some procedures, such as multiplying or dividing by a negative number and taking reciprocals, reverses equalities:

EXERCISE

1. If $x-4=11$, What is the value of $x-8$?
   (a) -15 (b) -7 (c) 7 (d) 17
2. If w is an integer and the average of 3, 4 and w is less than 10, what is the greatest possible value of w?
   (a) 22 (b) 25 (c) 28 (d) 32
3. For what value of x is $\frac{4}{x}+\frac{3}{5}=\frac{10}{x}$?
   (a) 5 (b) 10 (c) 15 (d) 25
4. If x is positive and $y=5x^2+3$, while of the following is an expression for x in terms of y?
   (a) $\sqrt{\frac{y-3}{5}}$ (b) $\sqrt{\frac{y+3}{5}}$ (c) $\frac{\sqrt{y}+3}{5}$ (d) $\frac{\sqrt{y}-3}{5}$
5. If x is positive number and $x^2+64=100$, what is the value of x?
   (a) 6 (b) 12 (c) 36 (d) 56
6. What is the largest value of x that satisfies the equation $2x^2-3x=0$?
   (a) 0.5 (b) 1.5 (c) 2.5 (d) 3.5
7. If $2^{x+3}=32$, what is the value of 3^{x+2}?
   (a) 110 (b) 90 (c) 96 (d) 81
8. If $3a+5b=10$ and $5a+3b=30$, what is the average of a and b?
   (a) 2.5 (b) 3.5 (c) 4.5 (d) 5.5
9. If $4x+12=36$, what is the value of $x+3$?
   (a) 9 (b) 12 (c) 18 (d) 36
10. If $7x+10=44$, what is the value $7x-10$?
    (a) 10 (b) 12 (c) 24 (d) 38
11. If $4x+13=7-2x$, what is the value of x
    (a) -1 (b) -3 (c) -5 (d) -7
12. If $x-4=9$, what is the value of x^2-4?
    (a) 100 (b) 120 (c)165 (d) 182
13. If $ax-b=c-dx$, what is value of x in terms of a, b, c, and d?
    (a) $\frac{c+d}{a+b}$ (b) $\frac{c-b}{a-d}$ (c) $\frac{b+c+d}{a}$ (d) $\frac{b+c}{a+d}$
14. If $\frac{1}{3}x+\frac{1}{6}x+\frac{1}{9}x=33$, what is the value of x?
    (a) 18 (b) 36 (c) 54 (d) 66
15. If $3x-4=11$, what is the value of $(3x-4)^2$?

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(a) 88 (b) 100 (c) 121 (d) 139

16. If $64^{12} = 2^{a-3}$, what is the value of a?
(a) 42 (b) 49 (c) 56 (d) 75

17. If average of 3a and 4b is less than 50, and a is twice b, what is the largest possible integer value of a?
(a) 15 (b) 19 (c) 29 (d) 39

18. If $\frac{1}{a-b} = 5$, then a =
(a) $b + \frac{1}{5}$ (b) $b - \frac{1}{5}$ (c) $\frac{1-5}{b}$ (d) $b + 5$

19. If $x = 3a + 7$ and $y = 9a^2$, what is y in terms of x?
(a) $(x-7)^2$ (b) $(x-3)^2$ (c) $\left(\frac{x-7}{3}\right)$ (d) $\left(\frac{x-7}{3}\right)^2$

20. If $4y - 3x = 5$, what is the smallest integer value of x for which $y > 100$?
(a) 110 (b) 132 (c) 138 (d) 140

Answers and Explanations

1. Answer (c)

add 4 to each side: $x = 15$. But this is not the answer. You need the value not of x, but of $x - 8$: $15 - 8 = 7$.

2. Answer (a)

Set up the inequality: $\frac{3+4+w}{3} \angle 10$.

get rid of fraction by multiplying by 3: $3 + 4 + w \angle 30$.

(combine like terms): $7 + w \angle 30$.

Finally, subtract 7 from each ride: $w \angle 23$.

Since w is integer, the most it can be is 22.

3. Answer (b).

Multiply each side by $5x$:

$5x\left(\frac{4}{x}\right) + 5x\left(\frac{3}{5}\right) = 5x\left(\frac{10}{x}\right) \Rightarrow 20 + 3x = 50$

Now solve normally. $20 + 3x = 50 \Rightarrow 3x = 30 \Rightarrow x = 10$

4. Answer (a)

$y = 5x^2 + 3 \Rightarrow y - 3 = 5x^2 \Rightarrow \frac{y-3}{5} = x^2$

Now take the square root of each side; since x is positive, the only solotion is $x = \sqrt{\frac{y-3}{5}}$

5. Answer (a)

$x^2 + 64 = 100 \Rightarrow x^2 = 36 \Rightarrow x = \sqrt{36} = 6$

6. Answer (b)

$2x^2 - 3 = 0 \Rightarrow x(2x - 3) = 0$
$x = 0$ or $2x - 3 = 0$
$x = 0$ or $2x = 3$
$x = 0$ or $x = 1.5$

7. Answer (d)

$2^{x+3} = 32 = 2^5 \Rightarrow x + 3 = 5 \Rightarrow x = 2$.

Therefore, $x + 2 = 4$,

and $3^{x+2} = 3^4 = 3 \times 3 \times 3 \times 3 = 81$

8. Answer (a)

Add the two equations: $3a + 5b = 10$
$+ 5a + 3b = 40$
$8a + 8b = 50$

Divide both sides by 8: $a + b = 5$

The average of a and b is: $\frac{a+b}{2} = \frac{5}{2} = 2.5$

9. Answer (a)

The easiest method is to recognise that $x + 3$ is $\frac{1}{4}$ of $4x + 12$ and, therefore, equals $\frac{1}{4}$ of 36, which is 9. If you don't see that, solve normally:

$4x + 12 = 36 \Rightarrow 4x = 24 \Rightarrow x - 6 \Rightarrow x + 3 = 9$

10. Answer (c)

Subtracting 20 from each side of $7x + 10 = 44$ gives $7x - 10 = 24$. If you dont see that, subtract 10 from each side, getting $7x = 34$. The wrest alternative is to divide both sides of $7x = 34$ by 7 to get $x = \frac{34}{7}$, then you have to multiply by 7 to get back to 34, and then subtracting 10.

11. Answer (a)

Add $2x$ to each side: $6x + 13 = 7$.

$\Rightarrow x = -1$

12. Answer (c)

$x - 4 = 9 \Rightarrow x = 13 \Rightarrow x^2 = 169 \Rightarrow x^2 - 4 = 165.$

13. Answer (d)

Treat a, b, c and of as constants and solve for x:

$ax - b = c - dx \Rightarrow ax - b + dx = c$

$\Rightarrow ax + dx = c + b \Rightarrow x(a + d) = b + c$

$\Rightarrow x = \frac{b + c}{a + d}$

14. Answer (c)

Multiply both sides by 18, then L. C. D.

$18\left(\frac{1}{3}x + \frac{1}{6}x + \frac{1}{9}x\right) = 18(33)$

$\Rightarrow 6x + 3x + 2x = 594$

$\Rightarrow 11x = 594$

$\Rightarrow x = 54$

15. Answer (c)

Since you are given the value of $3x - 4$, and want the value of $(3x - 4)^2$, just square both sides: $11^2 = 121$. If you dont see that, you will waste time solving $3x - 4 = 11$ ($x = 5$), only to use that value to calculate that $3x - 4$ is equal to 11, which you already knew.

16. Answer (d)

$2^{a-3} = 64^{12} = (2^6)^{12} = 2^{72} \Rightarrow a - 3 = 72 \Rightarrow a = 75$

17. Answer (b)

Since $a = 2b$, $2a = 4b$. Therefore, the average of $3a$ and $4b$ is the average of $3a$ and $2a$, which is $2.5a$. Therefore, $2.5a \angle 50 \Rightarrow a \angle 20$. So, the largest integer value of a is 19.

18. Answer (a)

Taking the reciprocal of each side, we get.

$$a - b = \frac{1}{5}. \text{ So } a = b + \frac{1}{5}$$

19. Answer (a)

$x = 3a + 7 \Rightarrow x - 7 = 3a \Rightarrow a = \frac{x - 7}{3}$

Therefore, $y = 9a^2 = 9\left(\frac{x - 7}{3}\right)^2 = 9\frac{(x - 7)^2}{(3)^2} = (x - 7)^2$

20. Answer (b)

First solve for y in terms of x:

$$4y - 3x = 5 \Rightarrow 4y = 5 + 3x \Rightarrow y = \frac{5 + 3x}{4}$$

Then, since $y > 100$.

$$\frac{5 + 3x}{4} > 100 \Rightarrow x > 131.666$$

The smallest integer value of x is 132.

BASIC ARITHMETIC

DECIMALS AND FRACTIONS

A fraction represents a part of a whole or, more generally, any number of equal parts. When spoken in everyday English, a fraction describes how many parts of a certain size there are, for example, one-half, eight-fifths, three-quarters. A common fraction such as 1/2, 8/5, 3/4, consists of an integer numerator and a non-zero integer denominator –the numerator representing a number of equal parts and the denominator indicating how many of those parts make up a whole. An example is 3/4, in which the numerator, 3, tells us that the fraction represents 3 equal parts, and the denominator, 4, tells us that 4 parts equal a whole.

Fractions in which denominators are powers of 10 are known as decimal fractions. Thus, $\frac{1}{10}$ = 1 tenth = 0.1; $\frac{1}{100}$ = 1 hundredth = 0.01; $\frac{99}{100}$ = 99 hundredths = 0.99; $\frac{7}{1000}$ = 7 thousandths = 0.007, etc.

EXERCISE

1. The fraction $101\frac{27}{100000}$ in decimal form is:
   (a) 101.00027 (b) 101.0027 (c) 101..027 (d) 101.27
2. When .36 is written in simplest fractional form, the sum of numerator and the denominator is:
   (a) 10 (b) 34 (c) 20 (d) 25
3. What is the difference between the biggest and the smallest fraction among $\frac{2}{3}, \frac{3}{4}, \frac{4}{5}$ and $\frac{5}{6}$?
   (a) $\frac{1}{6}$ (b) $\frac{1}{12}$ (c) $\frac{1}{20}$ (d) $\frac{1}{30}$
4. Which of the following fractions is the smallest?
   (a) $\frac{13}{16}$ (b) $\frac{15}{19}$ (c) $\frac{17}{21}$ (d) $\frac{7}{8}$
5. $12.1212 + 17.0005 - 9.1102 = ?$
   (a) 20.15 (b) 20.0105 (c) 20.0015 (d) 20.0115
6. $892.7 - 573.07 - 95.007 = ?$
   (a) 224.623 (b) 224.777 (c) 233.523 (d) 414.525
7. $0.002 \times 0.5 = ?$
   (a) 0.0001 (b) 0.001 (c) 0.01 (d) 0.1
8. $16.02 \times 0.001 = ?$
   (a) 0.001602 (b) 0.01602 (c) 0.1602 (d) 1.6002
9. $\left[.00625 \text{ of } \frac{23}{5}\right]$, when expressed as a fraction, equals:
   (a) $\frac{23}{80}$ (b) $\frac{23}{800}$ (c) $\frac{23}{8000}$ (d) $\frac{125}{28}$

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10. $0.213 \div 0.00213 = ?$
(a) 1 (b) 10 (c) 100 (d) 1000

11. 4.036 divided by 0.04 gives.
(a) 1.009 (b) 10.09 (c) 100.9 (d) 1000.9

12. $\frac{1}{0.04}$ is equal to:
(a) $\frac{1}{40}$ (b) $\frac{2}{5}$ (c) 2.5 (d) 25

13. 0.36 expressed in the form of $\frac{p}{q}$ equal:
(a) $\frac{9}{25}$ (b) $\frac{4}{13}$ (c) $\frac{4}{23}$ (d) $\frac{35}{99}$

14. The value of 2.136 is:
(a) $2\frac{10}{19}$ (b) $2\frac{68}{295}$ (c) $2\frac{3}{22}$ (d) $2\frac{17}{125}$

15. If $213 \times 16 = 3408$, then 1.6×21.3 is equal to:
(a) 0.3408 (b) 3.408 (c) 34.08 (d) 340.8

ANSWERS AND EXPLANATIONS

1. Answer (a)

$101\frac{27}{100000} = 101 + \frac{27}{100000} = 101 + .00027 = 101.00027$

2. Answer (b)

$0.36 = \frac{36}{100} = \frac{9}{25}$

Sum of Numerator and Denominator = 9 + 25 = 34.

3. Answer (a)

Convert each of the given fractions into decimal form:

$\frac{2}{3} = 0.66, \frac{3}{4} = 0.75, \frac{4}{5} = 0.8, \frac{5}{6} = 0.833$

Since $0.833 > 0.8 > 0.75 > 0.66$, so $\frac{5}{6} > \frac{4}{5} > \frac{3}{4} > \frac{2}{3}$

Required difference = $\left(\frac{5}{6} - \frac{2}{3}\right) = \frac{1}{6}$

4. Answer (b)

We have $\frac{13}{16} = 0.8125, \frac{15}{19} = 0.7894, \frac{17}{21} = 0.8095$

and $\frac{7}{8} = 0.875$.

5. Answer (d)

Given expression = $(12.1212 + 17.0005) - 9.1102$

$= (29.1217 - 9.1102) = 20.0115$.

6. Answer (a)

Give expression = $892.7 - (573.07 - 95.007)$

$= 892.7 - 668.077 = 224.623$

7. Answer (b)

$2 \times 5 = 10$, sum of decimal places = 4

$0.002 \times 0.5 = 0.0010 = 0.001$.

8. Answer (b)

$1602 \times 1 = 1602$.

Sum of decimal places = 5

$1602 \times 0.001 = 0.01602$

9. Answer (b)

$\left(.00625 \text{ of } \frac{23}{5}\right) = \frac{625}{100000} \times \frac{23}{5} = \frac{23}{800}$

10. Answer (c)

$\frac{0.213}{0.00213} = \frac{0.213 \times 100000}{0.00213 \times 100000} = \frac{213 \times 100}{213} = 100$

11. Answer (c)

$\frac{4.036}{0.04} = \frac{403.6}{4} = 100.9$

12. Answer (d)

$\frac{1}{0.04} = \frac{100}{4} = 25$

13. Answer (a)

$0.36 = \frac{36}{100} = \frac{4}{25}$

14. Answer (d)

$2.136 = 2 + 0.136 = 2 + \frac{136}{1000} = 2 + \frac{17}{125} = 2\frac{17}{125}$

15. Answer (c)

$1.6 \times 21.3 = \left(\frac{16}{10} + \frac{213}{10}\right) = \left(\frac{16 \times 213}{100}\right) = \frac{3408}{100} = 34.08$

PERCENTAGE

By a certain *percent*, we mean that many hundredths. Thus, x percent means x hundredths, written as $x\%$.

To express $x\%$ as a fraction: We have, $x\% = \frac{x}{100}$

Thus, $50\% = \frac{50}{100} = \frac{1}{2}$

To express $\frac{a}{b}$ as a percent: We have, $\frac{a}{b} = \left(\frac{a}{b} \times 100\,\%\right)$

Thus, $\frac{1}{4} = \left(\frac{1}{4} \times 100\,\%\right) = 25\%$

Example: If 500 is reduced by 25% what is the new value?

Explanation: Let x be new value. So $x = 500 - (25\% \text{ of } 500) \Rightarrow x = 500 - 100 = 400$

EXERCISE

1. A balsman scored 120 runs which included 9 boundaries and 4 sixes. What percent of his total score did he make by running between the wickets?
   (a) 45% (b) 50% (c) 55% (d) 60%
2. 65% of a number is 21 less than four fifth of that number. What is the number?
   (a) 100 (b) 120 (c) 140 (d) 160
3. Two students appeared at an examination. One of them secured 9 marks more than the other and his marks was 56% of the sum of their marks. The marks obtained by them are:
   (a) 28, 30 (b) 33, 36 (c) 42, 33 (d) 40, 44
4. In an election between two candidates, 75% of the voters cast their votes out of which 2% of the votes were declared invalid. A candidate got 9261 votes which were 75% of the total valid votes Find the total number of votes enrolled in that election.
   (a) 16800 (b) 17000 (c) 17200 (d) 17500
5. A fruit seller had some apples. He sells 40% apples and still has 420 apples. Originally, he had:
   (a) 300 apples (b) 400 apples (c) 500 apples (d) 700 apples
6. How many kg of pure salt must be added to 30kg of 2% solution of salt and water to increase it to 10% solution?

(a) 5 / 2 (b) 7 / 5 (c) 8 / 5 (d) 8 / 3

7. Three candidates contested an election and received 1136, 7636 and 11628 votes respectively. What percentage of the total votes did the winning candidate get?

(a) 57% (b) 65% (c) 68% (d) 80%

8. In a certain school, 20% of students are below 8 years of age. The number of students above 8 years of age is two third of the number of students of 8 years of age which is 48. What is the total number of students in the school?

(a) 65 (b) 74 (c) 100 (d) 110

9. Two numbers A and B are such that the sum of 5% of A and 4% of B is two-third of the sum of 6% of A and 8% of B. Find the ratio of A : B.

(a) 1 : 2 (b) 2 : 2 (c) 3 : 5 (d) 4 : 3

10. Two trailers X and Y are paid a total of Rs. 550 per week by their employer. If X is paid 120 percent of the sum paid to Y, how much is Y paid per week?

(a) Rs. 120 (b) Rs. 250 (c) Rs. 280 (d) Rs. 320

11. If A = x% of y and B = y% of x, then which of the following is true?

(a) A is smaller than B. (b) A is greater than B

(c) A = B (d) Relationship between A and B cannot be determined

12. What percentage of numbers from 1 to 70 have 1 or 9 in the unit's digit?

(a) 2% (b) 16% (c) 20% (d) 33%

13. If 20% of a = b, then b% of 20 is the same as:

(a) 4% of a (b) 7% of a (c) 12% of a (d) 25% of a

14. If the numerator of a fraction be increased by 15% and its denominator be diminished by 8% , the value of the fraction is 15/16. Find the original fraction.

(a) 2 / 3 (b) 3 / 4 (c) 5 / 4 (d) 6 / 5

15. Amir's mathematics test had 75 problems i.e. 10 arithmetic, 30 algebra and 35 geometry problems. Although he answered 70% of the arithmetic, 40% of the algebra, and 60% of the geometry problems correctly. He did not pass the test because he got less than 60% of the problems right. How many more questions he would have to answer correctly to earn 60% of the passing grade?

(a) 3 (b) 4 (c) 5 (d) 6

ANSWERS AND EXPLANATIONS

1. Answer (b)

No. of runs made by running = 120 – (9 * 4 + 4 * 6) = 60

So, required percentage = (60/120) * 100 = 50%

2. Answer (c)

Let the number be x.

Then, (4 * x / 5) – (65% of x) = 21

==> (4 * x / 5) – (65x / 100) = 21

==> 5 x = 2100

==> x = 140.

3. Answer (c)

Let their marks be (x + 9) and x.

Then, x + 9 = 56% of (x + 9 + x)

$\Rightarrow\ 25(x+9) = 14(2x+9)$

$\Rightarrow\ 3x = 99$

$\Rightarrow\ x = 33$

So, their marks are 42 and 33.

4. Answer (a)

Let the number of votes enrolled be x.

Then, No. of votes cast = 75% of x.

Valid votes = 98% of (75% of x).

75% of (98% of (75% of x)) = 9261.

[(75 / 100) * (98 / 100) * (75 / 100) * x] = 9261.

x = [(9261 * 100 * 100* 100) / (75 *98 * 75)] =16800.

5. Answer (d)

Suppose originally he had x apples.

Then, (100 - 40)% of x = 420.

$\Rightarrow \frac{60}{100} \times x = 420$

$\Rightarrow x = \left(\frac{420 \times 100}{60}\right) = 700$

6. Answer (d)

Amount of salt in 30kg sol. = [(2 / 100)*30] kg = 0.6 kg

Let x kg of pure salt be added

Then, (0.6 + x) / (30 + x)= 10 / 100

==> 60 + 100x = 300 + 10x

==> 90x = 240 ==> x = 8 / 3.

7. Answer (a)

no. of votes polled = (1136 + 7636 + 11628) = 20400.

$\therefore$ Required percentage = $\left(\frac{11628}{20400} \times 100\%\right) = 57\%$

8. Answer (c)

Let the number of students be x.

Then, Number of students above 8 years of age = (100 – 20)% of x = 80% of x.

$\therefore$ 80% of $x = 48 + \frac{2}{3}$ of 48

$\Rightarrow \frac{80}{100}x = 80$

$\Rightarrow x = 100.$

9. Answer (d)

5% of A + 4% of B = $\frac{2}{3}$ (6% of A + 8% of B)

$\Rightarrow \frac{5}{100}A + \frac{4}{100}B = \frac{2}{3}\left(\frac{6}{100}A + \frac{8}{100}B\right)$

$\Rightarrow \frac{1}{20}A + \frac{1}{25}B = \frac{1}{25}A + \frac{4}{75}B$

$\Rightarrow \left(\frac{1}{20} - \frac{1}{25}\right)A = \left(\frac{4}{75} - \frac{1}{25}\right)B$

$\Rightarrow \frac{1}{100}A = \frac{1}{75}B$

$\frac{A}{B} = \frac{100}{75} = \frac{4}{3}$

$\therefore$ Required ratio = 4 : 3

10. Answer (b)

Let the sum paid to Y per week be Rs. z.

Then, z + 120% of z = 550.

$\Rightarrow z + \frac{120}{100}z = 550$

$\Rightarrow \frac{11}{5}z = 550$

$\Rightarrow z = \left(\frac{550 \times 5}{11}\right) = 250.$

11. Answer (c)

$x\%$ of $y = \left(\frac{x}{100} \times y\right) = \left(\frac{y}{100} \times x\right) = y\%$ of x

$\therefore$ A = B

12. Answer (c)

Clearly, the numbers which have 1 or 9 in the unit's digit, have squares that end in the digit 1. Such numbers from 1 to 70 are 1, 9, 11, 19, 21, 29, 31, 39, 41, 49, 51, 59, 61, 69.

Number of such number =14

$\therefore$ Required percentage = $\left(\frac{14}{70} \times 100\right)\% = 20\%$.

13. Answer (a)

20% of $a = b \Rightarrow \frac{20}{100}a = b$.

$\therefore$ b% of $20 = \left(\frac{b}{100} \times 20\right) = \left(\frac{20}{100}a \times \frac{1}{100} \times 20\right)$

$= \frac{4}{100}a =$

4% of a.

14. Answer (b)

Let the original fraction be x/y.

Then (115% of x) / (92% of y) = 15 / 16

==> (115x / 92y) = 15 / 16

==> (x / y) = ((15 / 16) * (92 / 115)) = 3 / 4

15. Answer (c)

No. of questions attempted correctly = (70% of 10 + 40% of 30 + 60% Of 35) = 7 + 12 + 21 = 40

No. to be ans. correctly for 60% grade = 60% of 75 = 45

Therefore required number of questions = (45 - 40) = 5.

AVERAGE

The average of number of observations is the *Sum* divided the *total number of observations*.

$$\text{Average} = \left(\frac{\text{Sum of observations}}{\text{Number of observations}}\right)$$

Example: What is the average of x, 2x and 3x?
Explanation: Sum = x + 2x + 3x = 6x. So, average = 6x / 3 = 2x

EXERCISE

1. Find the average of all prime numbers between 30 and 50?

   (a) 35.75 (b) 38.6 (c) 39.8 (d) 42.1

2. In the first 10 overs of a cricket game, the run rate was only 3.2. What should be the run rate in the remaining 40 overs to reach the target of 282 runs?

   (a) 6.25 (b) 7.25 (c) 7.35 (d) 8.25

3. If the average marks of three batches of 55, 60 and 45 students respectively is 50, 55, 60, then the average marks of all the students is:

   (a) 48.50 (b) 54.68 (c) 60.65 (d) 62.75

4. There are two sections A and B of a class consisting of 36 and 44 students respectively. If the average weight of section A is 40 kg and that of section B is 35 kg, find the average weight of the whole class?

   (a) 37.25 kg (b) 36.10 kg (c) 39.30 kg (d) 38.75 kg

5. The average age of husband, wife and their child 3 years ago was 27 years and that of wife and the child 5 years ago was 20 years. The present age of the husband is:

   (a) 33 years (b) 40 years (c) 45 years (d) 48 years

6. A family consists of two grandparents, two parents and three grandchildren. The average age of the grandparents is 67 years, that of the parents is 35 years and that of the grandchildren is 6 years. What is the average age of the family?

   (a) 25 years (b) 27 years (c) 31 years (d) 35 years

7. The average weight of A, B and C is 45 kg. If the average weight of A and B is 40 kg and that of B and C is 43 kg, then the weight of B is:

(a) 12 kg (b) 15 kg (c) 25 kg (d) 31 kg

8. The captain of a cricket team of 11 members is 26 years old and the wicket keeper is 3 years older. If the ages of these two are excluded, the average age of the remaining players is one year less than the average age of the whole team. What is the average age of the team?

(a) 23 years (b) 25 years (c) 27 years (d) 30 years

9. A grocer has a sale of Rs. 6435, Rs. 6927, Rs. 6855, Rs. 7230 and Rs. 6562 for 5 consecutive months. How much sale must he have in the sixth month so that he gets an average sale of Rs. 6500?

(a) Rs. 4991 (b) Rs. 5050 (c) Rs. 5096 (d) Rs. 5210

10. Nine persons went to a hotel for taking their meals 8 of them spent Rs.12 each on their meals and the ninth spent Rs.8 more than the average expenditure of all the nine. What was the total money spent by them?

(a) Rs. 105 (b) Rs. 111 (c) Rs. 117 (d) Rs. 120

11. The average monthly income of P and Q is Rs. 5050. The average monthly income of Q and R is Rs. 6250 and the average monthly income of P and R is Rs. 5200. The monthly income of P is:

(a) 3000 (b) 4000 (c) 4200 (d) 4300

12. A car owner buys petrol at Rs.7.50, Rs. 8 and Rs. 8.50 per litre for three successive years. What approximately is the average cost per litre of petrol if he spends Rs. 4000 each year?

(a) Rs. 7.98 (b) Rs. 10.50 (c) Rs. 12.50 (d) Rs. 15

13. In Ali's opinion, his weight is greater than 65 kg but less than 72 kg. His brother doest not agree with Ali and he thinks that Ali's weight is greater than 60 kg but less than 70 kg. His mother's view is that his weight cannot be greater than 68 kg. If all are them are correct in their estimation, what is the average of different probable weights of Ali?

(a) 78 kg. (b) 72 kg. (c) 70 kg. (d) 67 kg

14. A pupil's marks were wrongly entered as 83 instead of 63. Due to that the average marks for the class got increased by half (1/2). The number of pupils in the class is:

(a) 8 (b) 15 (c) 40 (d) 55

15. A library has an average of 510 visitors on Sundays and 240 on other days. The average number of visitors per day in a month of 30 days beginning with a Sunday is:

(a) 240 (b) 245 (c) 270 (d) 285

ANSWERS AND EXPLANATIONS

1. Answer (c)

There are five prime numbers between 30 and 50.

They are 31, 37, 41, 43 and 47.

Therefore the required avg. = (31 + 37 + 41 + 43 + 47) / 5

==> 199 / 5 ==> 39.8.

2. Answer (a)

$$\text{Required run rate} = \left(\frac{282 - (3.2 \times 10)}{40}\right) = \frac{250}{40} = 6.25$$

3. Answer (b)

Required average = Error!

$= \left(\frac{2750 + 3300 + 2700}{160}\right) = 54.68$

4. Answer (a)

Total weight of (36 + 44) students = (36 * 40 + 44 * 35) kg

=2980kg

So, weight of the total class =(2980 / 80) kg = 37.25 kg.

5. Answer (b)

Sum of the present ages of husband, wife and child = $(27 \times 3 + 3 \times 3)$ years = 90 years.

Sum of the present ages of wife and child = $(20 \times 2 + 5 \times 2)$ years = 50 years.

$\therefore$ Husband's present age = (90 – 50) years = 40 years.

6. Answer (c)

Required average $= \left(\frac{67 \times 2 + 35 \times 2 + 6 \times 3}{2 + 2 + 3}\right)$

$= \left(\frac{134 + 70 + 18}{7}\right) = \frac{222}{7}$

= 31

7. Answer (d)

Let A, B, C represent their respective weights. Then, we have:

A + B + C = (45 x 3) = 135 .... (i)

A + B = (40 x 2) = 80 .... (ii)

B + C = (43 x 2) = 86 .... (iii)

Adding (ii) and (iii), we get: A + 2B + C = 166 .... (iv)

Subtracting (i) from (iv), we get: B = 31.

$\therefore$ B's weight = 31 kg.

8. Answer (a)

Let the average age of the whole team by x years.

$\therefore$ $11x - (26 + 29) = 9(x - 1)$

$\Rightarrow$ $11x - 9x = 46$

$\Rightarrow$ $2x = 46$

$\Rightarrow$ $x = 23$.

9. Answer (a)

Total sale for 5 months = Rs. (6435 + 6927 + 6855 + 7230 + 6562) = Rs. 34009.

$\therefore$ Required sale = Rs. [(6500 x 6) - 34009]

= Rs. (39000 - 34009)

= Rs. 4991.

10. Answer (c)

Let the average expenditure of all nine be Rs. x

Then 12 * 8 + (x + 8) = 9x or 8x = 104 or x = 13.

Total money spent = 9x = Rs. (9 * 13) = Rs 117.

11. Answer (b)

Let P, Q and R represent their respective monthly incomes. Then, we have:

$P + Q = (5050 \times 2) = 10100$ .... (i)

$Q + R = (6250 \times 2) = 12500$ .... (ii)

$P + R = (5200 \times 2) = 10400$ .... (iii)

Adding (i), (ii) and (iii), we get: 2(P + Q + R) = 33000 or P + Q + R = 16500 .... (iv)

Subtracting (ii) from (iv), we get P = 4000.

12. Answer (a)

Total quantity of petrol consumed in 3 years

$\left(\frac{4000}{7.50} + \frac{4000}{8} \frac{4000}{8.50}\right)$ litres $= 4000 \left(\frac{2}{15} + \frac{1}{8} + \frac{2}{17}\right)$ litres

$= \left(\frac{76700}{51}\right)$ litres

Total amount spent = Rs. (3×4000) = Rs. 12000

$\therefore$ Average cost = Rs. $\left(\frac{12000 \times 51}{76700}\right)$ = Rs. $\frac{6120}{767}$ = Rs 7.98

13. Answer (d)

Let Arun's weight by X kg.

According to Arun, 65 < X < 72

According to Arun's brother, 60 < X < 70.

According to Arun's mohter, X <= 68

The values satisfying all the above conditions are 66 67 and 68.

∴ Required average = $\left(\frac{66+67+68}{3}\right) = \left(\frac{201}{3}\right) =$ 67 kg.

14. Answer (c)

Let there be x pupils in the class.

Total increase in marks = $\left(x \times \frac{1}{2}\right) = \frac{x}{2}$

∴ $\frac{x}{2} = (83 - 63) \Rightarrow \frac{x}{2} = 20 \Rightarrow x = 40.$

15. Answer (d)

Since the month begins with a Sunday, to there will be five Sundays in the month.

Required average = $\left(\frac{510 \times 5 + 240 \times 25}{30}\right) = \frac{8550}{30} =$ 285

SQUARE ROOT AND CUBE ROOT

Square Root:

If $x^2 = y$, we say that the square root of y is x and we write $\sqrt{y} = x$.

Thus, $\sqrt{4} = 2, \sqrt{9} = 3, \sqrt{196} = 14.$

Cube Root:

The cube root of a given number x is the number whose cube is x.

We, denote the cube root of x by x.

Thus, $\sqrt[3]{8} = \sqrt[3]{2 \times 2 \times 2} = 2, \quad \sqrt[3]{343} = \sqrt[3]{7 \times 7 \times 7} = 7$ etc.

Note: $\sqrt{xy} = \sqrt{x}\sqrt{y}$

EXERCISE

1. The cube root of .000216 is:
   (a) .6 (b) .06 (c) 55 (d) 66

2. What should come in place of bothxin the equation $\frac{x}{\sqrt{128}} = \frac{\sqrt{162}}{x}$.
   (a) 12 (b) 15 (c) 82 (d) 100

3. The least perfect square, which is divisible by each of 21, 36 and 66 is:
   (a) 213444 (b) 215342
   (c) 216343 (d) 216345

4. If $3\sqrt{5}+125 = 17.88$, then what will be the value of $\sqrt{80} + 6\sqrt{5}$?
   (a) 10.25 (b) 15.28 (c) 18.30 (d) [illegible]

5. If $a = 0.1039$, then the value of $\sqrt{4a^2 - 4a + 1} + 3a$ is:
   (a) 0.1140 (b) 0.1240 (c) 1.1039 (d) [illegible]

6. The square root of $(7 + 3\sqrt{5})(7 - 3\sqrt{5})$ is
   (a) 3 (b) 2 (c) 1 (d) [illegible]

7. If $\sqrt{5} = 2.236$, then the value of $\frac{\sqrt{5}}{2} - \frac{10}{\sqrt{5}} + \sqrt{125}$ is equal to:
   (a) 4.29 (b) 7.826 (c) 8.724 (d) [illegible]

8. Errorl is equál to:
   (a) 5 (b) 7 (c) 9 (d) [illegible]

9. $\sqrt{0.0169 \times x} = 1.3$. Find x.
   (a) 0.10 (b) 100 (c) 10000 (d) [illegible]

10. $\left(\sqrt{3} - \frac{1}{\sqrt{3}}\right)^2$ simplifies to:

(a) $\frac{2}{3}$ (b) $\frac{3}{4}$ (c) $\frac{4}{3}$ (d) $\frac{4}{5}$

ANSWERS AND EXPLANATIONS

1. Answer (a)

$$(.000216)^{1/3} = \left(\frac{216}{10^6}\right)^{1/3} = \left(\frac{6\times6\times6}{10^2\times10^2\times10^2}\right)^{1/3}$$
$$= \frac{6}{10^2} = \frac{6}{100}$$
$$= 0.06$$

2. Answer (a)

Let $\frac{x}{\sqrt{128}} = \frac{\sqrt{162}}{x}$

Then $x^2 = \sqrt{128\times162}$
$$= \sqrt{64\times2\times18\times9}$$
$$= \sqrt{8^2\times6^2\times3^2}$$
$$= 8\times6\times3 = 144.$$
$\therefore x = 12.$

3. Answer (a)

L.C.M. of 21, 36, 66 = 2772.

Now, $2772 = 2\times2\times3\times3\times7\times11$

To make it a perfect square,

it must be multiplied by 7×11.

So, required number $= 2^2\times3^2\times7^2\times11^2 = 213444$

4. Answer (d)

$3\sqrt{5}+\sqrt{125} = 17.88$

$\Rightarrow 3\sqrt{5}+\sqrt{25\times5} = 17.88$

$\Rightarrow 3\sqrt{5}+5\sqrt{5} = 17.88$

$\Rightarrow 8\sqrt{5} = 17.88$

$\Rightarrow \sqrt{5} = 2.235$

$\therefore \sqrt{80}+6\sqrt{5} = \sqrt{16\times5}+6\sqrt{5}$
$$= 4\sqrt{5}+6\sqrt{5}$$
$$= 10\sqrt{5}$$
$$= (10\times2.235)$$
$$= 22.35$$

5. Answer (c)

$$\sqrt{4a^2-4a+1}+3a = \sqrt{(1)^2+(2a)^2-2\times1\times2a}+3a$$
$$= \sqrt{(1-2a)^2}+3a$$
$$= (1-2a)+3a$$
$$= (1+a)$$
$$= (1+0.1039)$$
$$= 1.1039$$

6. Answer (b)

$$\sqrt{(7+3\sqrt{5})(7-3\sqrt{5})} = \sqrt{(7)^2-(3\sqrt{5})^2}$$
$$= \sqrt{49-45}$$
$$= \sqrt{4} = 2$$

7. Answer (b)

$$\frac{\sqrt{5}}{2}-\frac{10}{\sqrt{5}}+\sqrt{125} = \frac{\sqrt{(5)^2}-20+2\sqrt{5}\times5\sqrt{5}}{2\sqrt{5}}$$
$$= \frac{5-20+50}{2\sqrt{5}}$$
$$= \frac{35}{2\sqrt{5}}\times\frac{\sqrt{5}}{\sqrt{5}} = \frac{35\sqrt{5}}{10}$$
$$= \frac{7\times2.236}{2} = 7\times1.118 = 7.826$$

8. Answer (a)

Given Expression $= \frac{25}{11}\times\frac{14}{5}\times\frac{11}{14} = 5.$

9. Answer (b)

Let $\sqrt{0.0169\times x} = 1.3.$

Then, $0.0169x = (1.3)^2 = 1.69$

$\Rightarrow x = \frac{1.69}{0.0169} = 100$

10. Answer (c)

$$\left(\sqrt{3}-\frac{1}{\sqrt{3}}\right)^2 = (\sqrt{3})^2+\left(\frac{1}{\sqrt{3}}\right)^2-2\times\sqrt{3}\times\frac{1}{\sqrt{3}}$$
$$= 3+\frac{1}{3}-2$$
$$= 1+\frac{1}{3} = \frac{4}{3}$$

PROBABILITY

Experiment:

An operation which can produce some well-defined outcomes is called an experiment.

Random Experiment:

An experiment in which all possible outcomes are know and the exact output cannot be predicted in advance, is called a random experiment.

Examples:

Rolling an unbiased dice.

Tossing a fair coin.

Drawing a card from a pack of well-shuffled cards.

Picking up a ball of certain colour from a bag containing balls of different colours.

Details:

When we throw a coin, then either a Head (H) or a Tail (T) appears.

A dice is a solid cube. having 6 faces, marked 1, 2, 3, 4, 5. 6 respectively. When we throw a die, the outcome is the number that appears on its upper face.

A pack of cards has 52 cards. It has 13 cards of each suit, named *Spades, Clubs, Hearts and Diamonds.* Cards of spades and clubs are *black cards.* Cards of hearts and diamonds are *red cards.* There are *Kings, Queens and Jacks.* These are all called *face cards.*

Sample Space:

When we perform an experiment, then the set S of all possible outcomes is called the *sample space.*

Examples:

In tossing a coin, S = {H, T}

If two coins are tossed, the S = {HH, HT, TH, TT}.

In rolling a dice, we have, S = {1, 2, 3, 4, 5, 6}.

Event:

Any subset of a sample space is called an *event.*

Probability of Occurrence of an Event:

Let S be the sample and let E be an event.

Then, $E \subseteq S$.

$$\therefore \quad P(E) = \frac{n(E)}{n(S)}$$

EXAMPLE: When a die is tossed, then the sample space is S = {1, 2, 3, 4, 5, 6}

A is an event of occurrence of an odd number and B is an event occurrence of a number greater than 4.

So, A = {1, 3, 5} and B = {5, 6}

P(A) = Probability of occurrence of an odd number = $\frac{n(A)}{n(S)} = \frac{3}{6} = \frac{1}{2}$

P(B) = Probability of occurrence of a number greater than 4 = $\frac{n(b)}{n(S)} = \frac{2}{6} = \frac{1}{3}$

Results on Probability:

$P(S) = 1$

$0 \leq P(E) \leq 1$

$P(\phi) = 0$

For any events A and B we have: $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

If A denotes (not-A), then P(A) = 1 – P(A).

EXERCISE

1. Tickets numbered 1 to 20 are mixed up and then a ticket is drawn at random. What is the probability that the ticket drawn has a number which is a multiple of 3 or 5?

(a) $\frac{1}{2}$ (b) $\frac{2}{5}$ (c) $\frac{7}{16}$ (d) $\frac{9}{20}$

2. In a box, there are 8 red, 7 blue and 6 green balls. One ball is picked up randomly. What is the probability that it is neither red nor green?

(a) $\frac{1}{3}$ (b) $\frac{2}{3}$ (c) $\frac{5}{9}$ (d) $\frac{7}{11}$

3. What is the probability of getting a sum 9 from two throws of a dice?

(a) $\frac{1}{3}$ (b) $\frac{2}{5}$ (c) $\frac{1}{9}$ (d) $\frac{3}{7}$

4. Three unbiased coins are tossed. What is the probability of getting at most two heads?

(a) $\frac{1}{3}$ (b) $\frac{3}{5}$ (c) $\frac{3}{7}$ (d) $\frac{7}{8}$

5. Two dice are thrown simultaneously. What is the probability of getting two numbers whose product is even?

(a) $\frac{1}{3}$ (b) $\frac{3}{4}$ (c) $\frac{3}{5}$ (d) $\frac{5}{9}$

6. In a lottery, there are 10 prizes and 25 blanks. A lottery is drawn at random. What is the probability of getting a prize?

(a) $\frac{1}{3}$ (b) $\frac{2}{9}$ (c) $\frac{2}{7}$ (d) $\frac{5}{11}$

7. Two dice are tossed. The probability that the total score is a prime number is:

(a) $\frac{1}{2}$ (b) $\frac{5}{12}$ (c) $\frac{2}{7}$ (d) $\frac{3}{11}$

8. A card is drawn from a pack of 52 cards. The probability of getting a queen of club or a king of heart is:

(a) $\frac{2}{13}$ (b) $\frac{3}{17}$ (c) $\frac{1}{26}$ (d) $\frac{2}{11}$

9. One card is drawn at random from a pack of 52 cards. What is the probability that the card drawn is a face card (Jack, Queen and King only)?

(a) $\frac{1}{11}$ (b) $\frac{3}{13}$ (c) $\frac{2}{4}$ (d) $\frac{5}{26}$

10. A bag contains 6 black and 8 white balls. One ball is drawn at random. What is the probability that the ball drawn is white?

(a) $\frac{2}{5}$ (b) $\frac{4}{7}$ (c) $\frac{3}{11}$ (d) $\frac{3}{19}$

ANSWERS AND EXPLANATIONS

1. Answer (d)

Here, S = {1, 2, 3, 4, ..., 19, 20}.

Let E = event of getting a multiple of 3 or 5 = {3, 6, 9, 12, 15, 18, 5, 10, 20}.

$\therefore P(E) = \frac{n(E)}{n(S)} = \frac{9}{20}$

2. Answer (a)

Total number of balls = (8 + 7 + 6) = 21.

Let E = event that the ball drawn is neither red nor green.

= event that the ball drawn is blue.

$\therefore$ $n(E) = 7$.

P(E) = n(E) / n(S) = 7 / 21 = 1 / 3

3. Answer (c)

In two throws of a die, $n(S) = (6 \times 6) = 36$.

Let E = event of getting a sum ={(3, 6), (4, 5), (5, 4), (6, 3)}.

$\therefore \quad P(E) = \frac{n(E)}{n(S)} = \frac{4}{36} = \frac{1}{9}$

4. Answer (d)

Here S = {TTT, TTH, THT, HTT, THH, HTH, HHT, HHH}

Let E = event of getting at most two heads.

Then E = {TTT, TTH, THT, HTT, THH, HTH, HHT}.

$\therefore \quad P(E) = \frac{n(E)}{n(S)} = \frac{7}{8}$

5. Answer (b)

In a simultaneous throw of two dice,

we have $n(S) = (6 \times 6) = 36$.

Then, E = {(1, 2), (1, 4), (1, 6), (2, 1), (2, 2), (2, 3), (2, 4), (2, 5), (2, 6), (3, 2), (3, 4), (3, 6), (4, 1), (4, 2), (4, 3), (4, 4), (4, 5), (4, 6), (5, 2), (5, 4), (5, 6), (6, 1), (6, 2), (6, 3), (6, 4), (6, 5), (6, 6)}

$\therefore \quad n(E) = 27$.

$\therefore \quad P(E) = \frac{n(E)}{n(S)} = \frac{27}{36} = \frac{3}{4}$

6. Answer (c)

P (getting a prize) $= \frac{10}{10+25} = \frac{10}{35} = \frac{2}{7}$

7. Answer (b)

Clearly, $n(S) = (6 \times 6) = 36$.

Let E = Event that the sum is a prime number.

Then E = {(1, 1), (1, 2), (1, 4), (1, 6), (2, 1), (2, 3), (2, 5), (3, 2), (3, 4), (4, 1), (4, 3), (5, 2), (5, 6), (6, 1), (6, 5)}

$\therefore \quad n(E) = 15$.

$\therefore \quad P(E) = \frac{n(E)}{n(S)} = \frac{15}{36} = \frac{5}{12}$

8. Answer (c)

Here, $n(S) = 52$.

Let E = event of getting a queen of club or a king of heart.

Then, $n(E) = 2$.

$\therefore \quad P(E) = \frac{n(E)}{n(S)} = \frac{2}{52} = \frac{1}{26}$

9. Answer (b)

Clearly, there are 52 cards, out of which there are 12 face cards.

$\therefore$ P (getting a face card) $= \frac{12}{52} = \frac{3}{13}$

10. Answer (b)

Let number of balls = (6 + 8) = 14.

Number of white balls = 8.

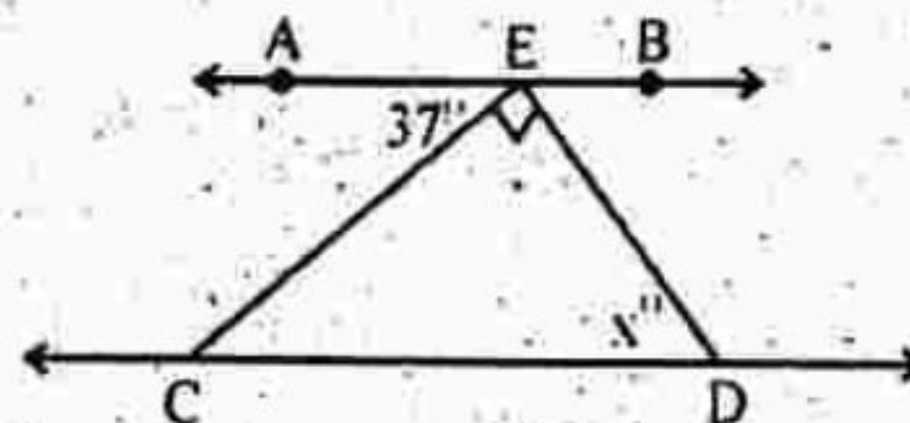
P (drawing a white ball) $= \frac{8}{14} = \frac{4}{7}$

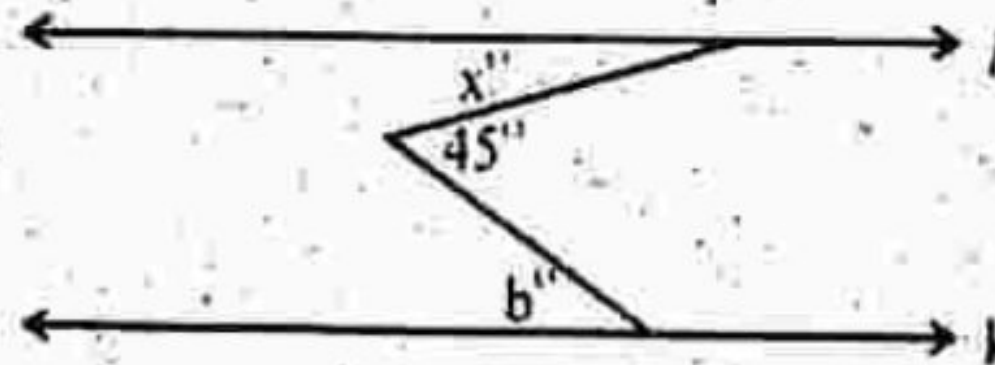
GEOMETRY

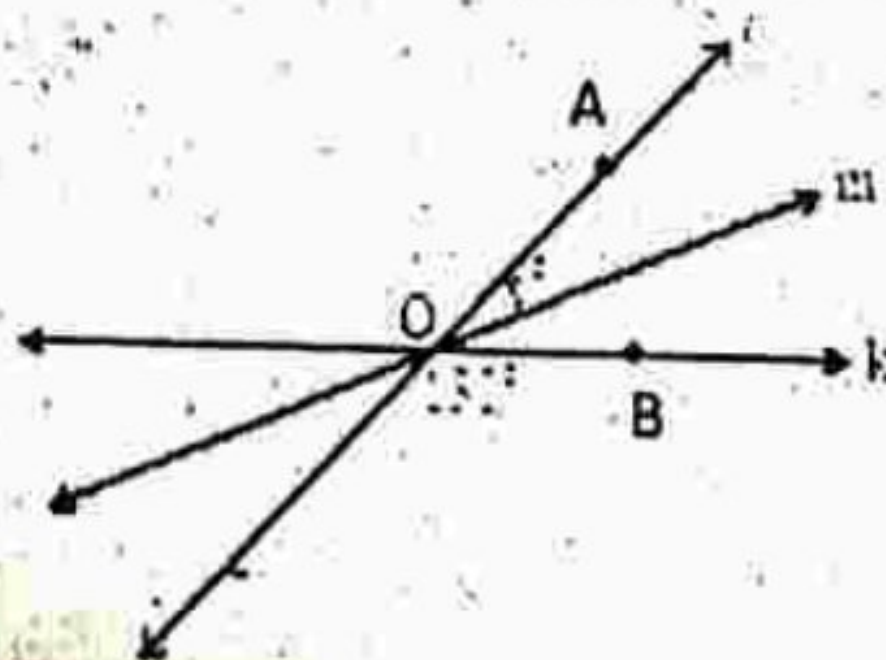
LINES AND ANGLES

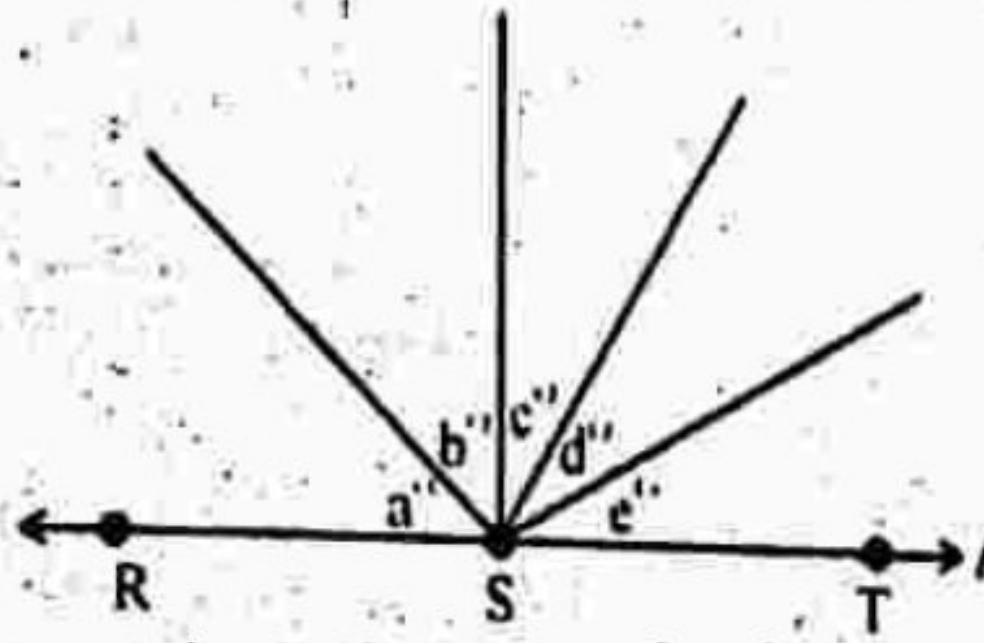
An angle is formed by the intersection of two lines segments, rays, or lines. The point of intersection is called the vertex.

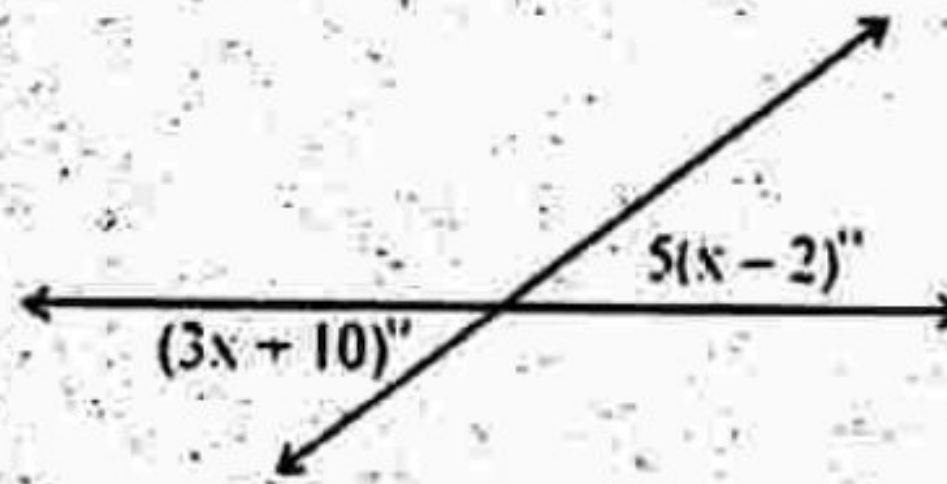
EXERCISE

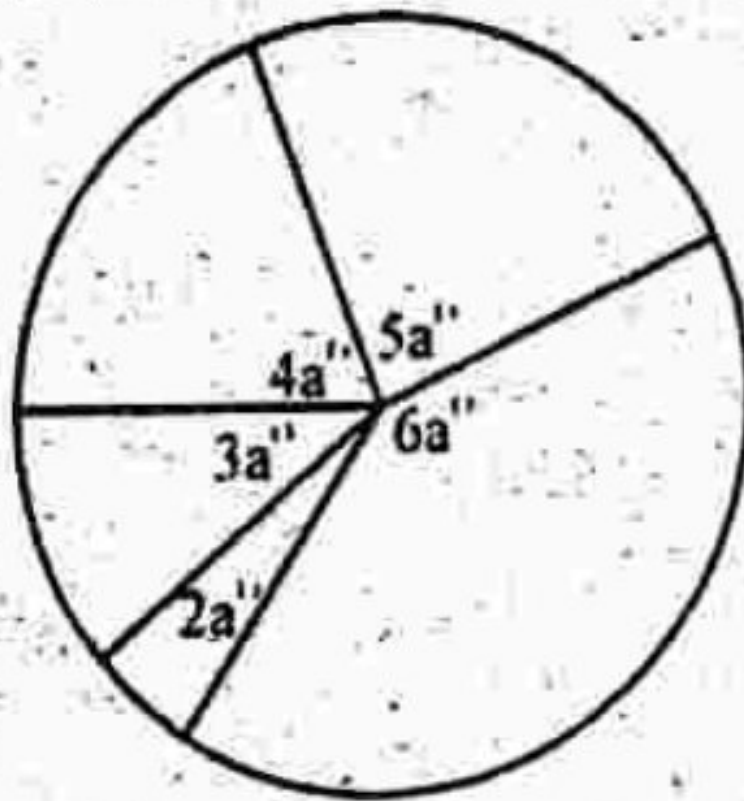
1. In the figure below, AB is parallel to CD. What is the value of x?

(a) 53 (b) 40 (c) 48 (d) 90

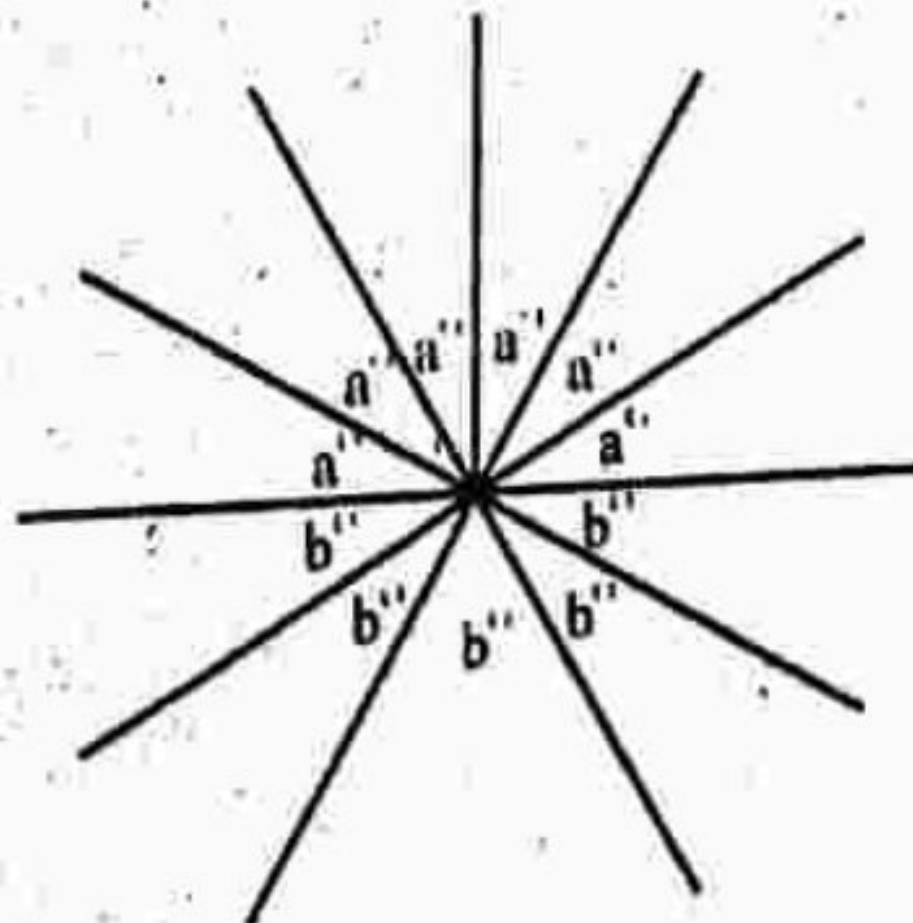
2. In the figure below, lines *l* and *k* are parallel. What is the value of a + b?

(a) 30 (b) 45 (c) 65 (d) 80

3. In the figure below, lines k, l, and m intersect at O. If line m bisects ∠AOB, what is the value of x?

(a) 25 (b) 35 (c) 45 (d) 50

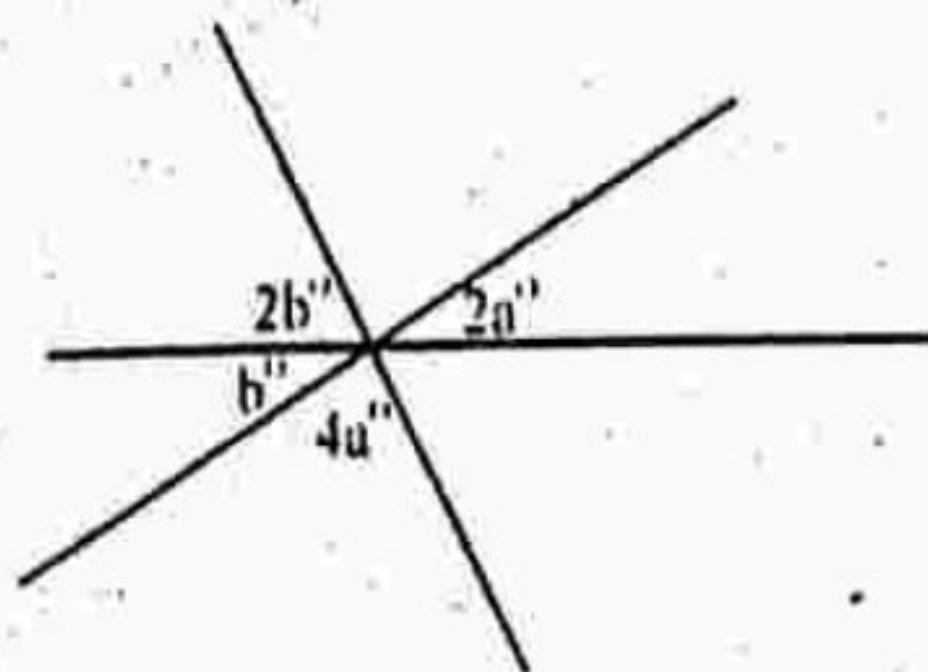
4. In the figure below, R, S, and T are all on line l. What is the average of a, b, c, d and e?

(a) 18 (b) 36 (c) 45 (d) 90

5. In the figure below, what is the value of x?

(a) 6 (b) 8 (c) 10 (d) 20

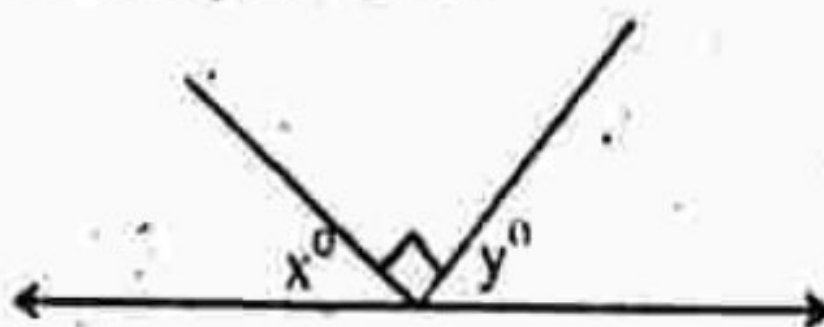
6. In the figure below, what is the average (arithmetic mean) of the measures of the five angles?

(a) 36 (b) 45 (c) 60 (d) 72

7. In the figure below, what is the value of $\frac{b+a}{b-a}$?

(a) 1 (b) 10 (c) 11 (d) 30

8. In the figure below, what is the value of b?

2b° 2a° b° 4a°

(a) 9 (b) 18 (c) 27 (d) 36

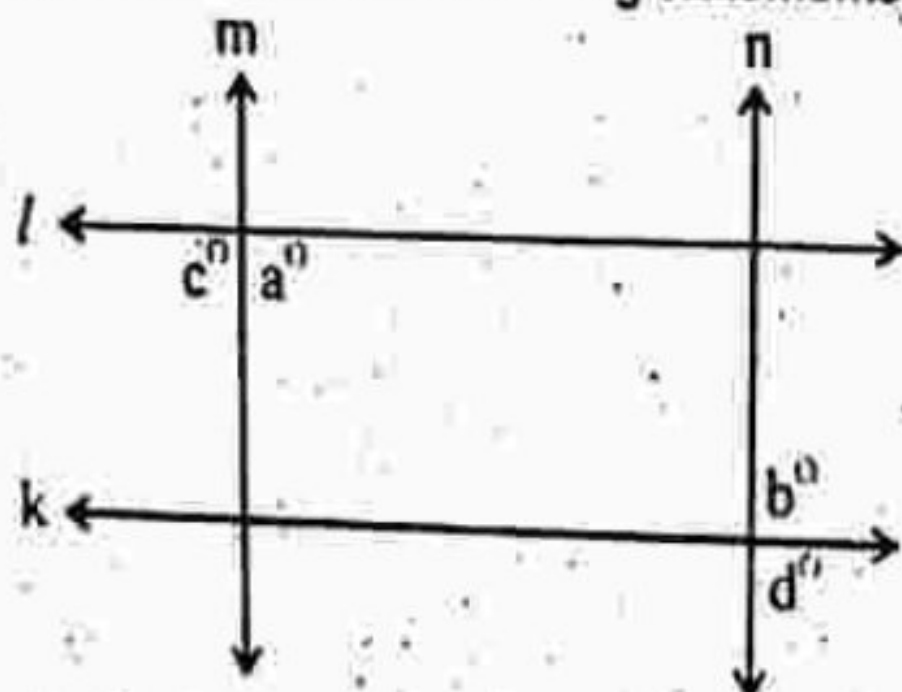
9. In the figure below, what is the value of x if y : x = 3 : 2?

x° y°

(a) 18 (b) 27 (c) 36 (d) 45

10. What is the measure of the angle formed by the minute and hour hands of a clock at 1 : 50?

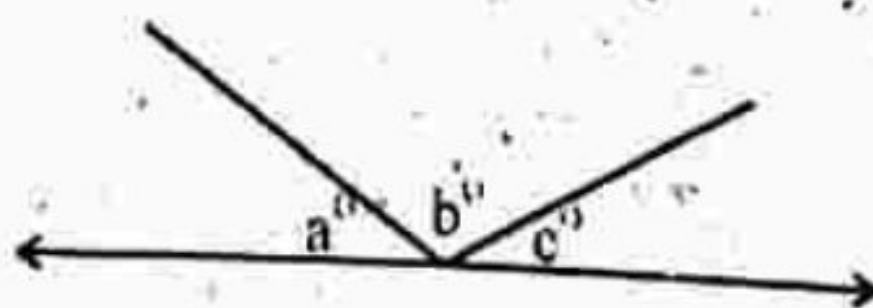
(a) 90° (b) 95° (c) 105° (d) 115°

11. Concerning of the figure below, if a = b, which of the following statements must be true?

m n l k c° a° b° d°

I. c = d
II. l and k are parallel
III. m and l are perpendicular

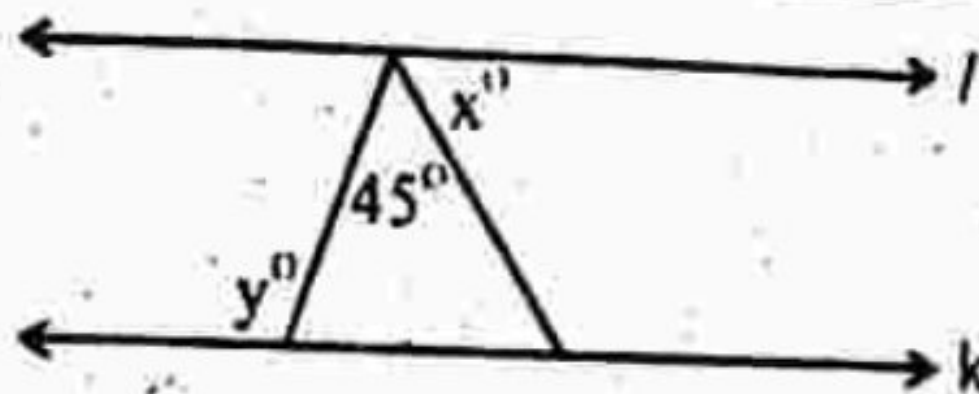
(a) I only (b) I and II only (c) I and III only (d) I, II and III

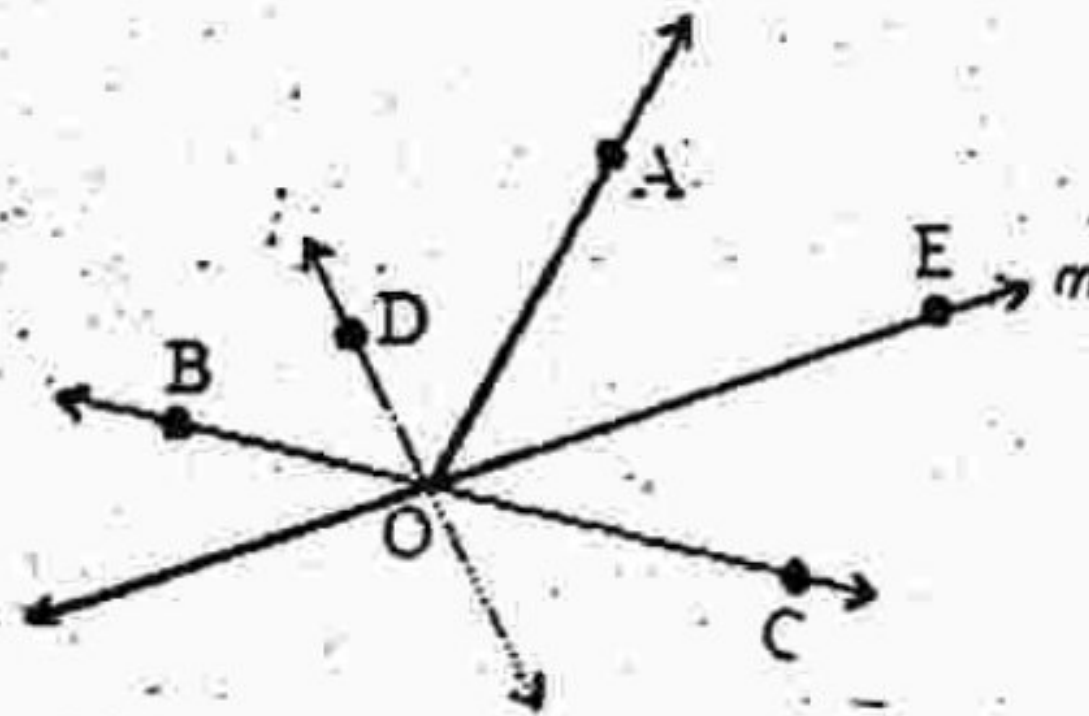
12. In the figure below, a : b = 3 : 5 and c : b = 2 : 1. What is the measure of the largest angle?

a° b° c°

(a) 30 (b) 45 (c) 90 (d) 100

13. A, B and C are points on a line with B between A and C. Let M and N be the midpoints of AB and BC, respectively. If AB : BC = 3 : 1, what is MN : BC?

(a) 1 : 2 (b) 2 : 3 (c) 1 : 1 (d) 2 : 1

14. In the figure below, lines k and l are parallel. What is the value of y – x?

(a) 15 (b) 30 (c) 45 (d) 60

15. In the figure below, line m bisects ∠AOC and line *l* bisects ∠AOB. What is the measure of ∠DOE?

(a) 75 (b) 90 (c) 100 (d) 105

ANSWERS AND EXPLANATIONS

1. Answer (a)

$37 + 90 + x = 180 \Rightarrow 127 + x = 180 \Rightarrow x = 53$

2. Answer (b)

It is impossible to determine the value of either *a* or *b*. We can however, find $a + b$. We can draw a line through the vertex of the angle parallel to *l* and *k*. Then $a = x$, and looking at the bottom two lines, we see that $b = y$. So, $a + b = x + y = 45$

3. Answer (a)

$\angle AOB + 130 = 180$

$\Rightarrow m\angle AOB = 50;$

and since *m* bisects ∠AOB, $x = 25$

4. Answer (b)

The sum of *a*, *bc*, *d* and *e* is 180,

and so their average is $\frac{180}{5} = 36$

5. Answer (c)

Since the measures of the vertical angles are equal,

$3x + 10 = 5(x - 2)$.

$\Rightarrow 3x + 10 = 5x - 10$

$\Rightarrow 3x + 20 = 5x$

$\Rightarrow 20 = 2x$

$\Rightarrow x = 10$

6. Answer (d)

The making in the angles are irrelevant. The sum of the measures of the five angles is 360^0, and $360 \div 5 = 72$; but you would have wasted time.

7. Answer (c)

From the diagram,

we see that $6a = 180$ which implies that $a = 30$, and that $5b = 180$, which implies that $b = 36$.

So, $\frac{b+a}{b-a} = \frac{36+30}{36-30} = \frac{66}{6} = 11$

8. Answer (d)

Since vertical angles and equal, the two unmarked angles are $2b$ and $4a$. Since the sum of the six angles is 360^0.

$360 = 4a + 2b + 2a + 4a + 2b + b = 10a + 5b$.

However, since vertical angles are equal, $b = 2a$

$\Rightarrow 5b = 10a$.

Hence, $360 = 10a + 5b = 10a + 10a = 20a$

$\Rightarrow a = 18$ and $b = 36$

9. Answer (c)

Since $x + y + 90 = 180$, $x + y = 90$.

Also since $y{:}x = 3{:}2$, $y = 3t$ and $x = 2t$.

Therefore $3t + 2t = 90 \Rightarrow 5t = 90 \Rightarrow t = 18$

$\Rightarrow x = 2(18) = 36$

10. Answer (d)

For problems such as this, always draw a diagram. The measure of each of the 12 central angles from one number to the next on the clock is 30^0. At 1:50

the minute hand is pointing at 10, and the hour hand has gave $\frac{5}{6}$ of the way from 1 to 2. So from 10 to 1 on the clock is 90^0 and from 1 to the hour hand is $\frac{5}{6}$ x $30^0 = 25^0$ for total of $90 + 25 = 115^0$

11. Answer (a)

No conclusions can be made about the lines; they could form any angles whatsoever. (II and III are both false) I is true.

$c = 180 - a = 180 - b = d$.

12. Answer (d)

Since $a : b = 3 : 5$, then $a = 3x$ and $b = 5x$

and since $c : b = c : 5x = 2 : 1$, $c = 10x$.

Then $3x + 5x + 10x = 180$

$\Rightarrow 18x = 180$

$\Rightarrow x = 10$

$\Rightarrow c = 10x = 100$.

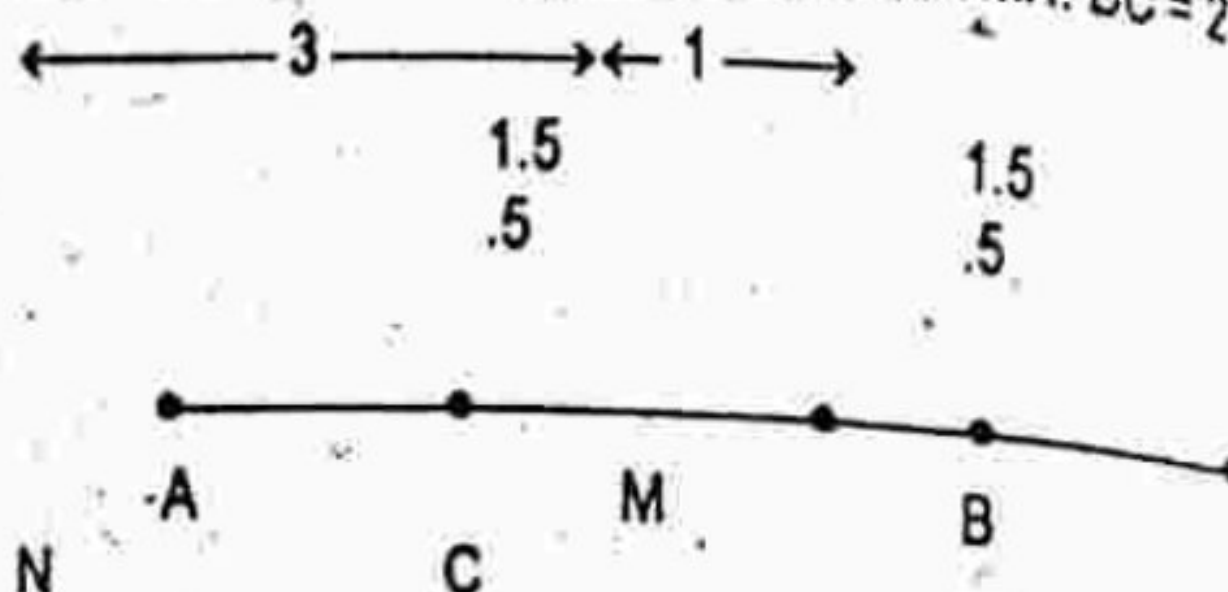
13. Answer (d)

From the figure below, you can see that MN: BC = 2:1

⟵ 3 ⟶⟵ 1 ⟶

1.5 .5 1.5 .5

A M B

N C

14. Answer (c)

Since the lines are parallel, the angle marked y and the sum of the angles marked x and 45 are equal: $y = x + 45 \Rightarrow y - x = 45$.

15. Answer (b)

Let $x = \frac{1}{2}m\angle AOC$, and $y = \frac{1}{2}m\angle AOB$.

Then, $x + y = \frac{1}{2}m\angle AOC + \frac{1}{2}m\angle AOB = \frac{1}{2}(180) = 90$

AREA AND PERIMETER

IMPORTANT FORMULAE

1. (a) Area of a rectangle = (Length x Breadth).

   $\therefore$ Length = $\left(\frac{\text{Area}}{\text{Breadth}}\right)$ and Breadh = $\left(\frac{\text{Area}}{\text{Length}}\right)$

   (b) Perimeter of a rectangle = 2(Length + Breadth).

2. Area of a square = $(\text{side})^2 = \frac{1}{2}(\text{diagonal})^2$.

3. (a) Area of a triangle = $\frac{1}{2} \times$ Base $\times$ Height.

   (b) Area of an equilateral triangle = $\frac{\sqrt{3}}{4} \times (\text{side})^2$

   (c) Radius of incircle of an equilateral triangle of side a, = $\frac{a}{2\sqrt{3}}$.

   (d) Radius of circumcircle of an equilateral triangle of side a, = $\frac{a}{\sqrt{3}}$.

4. (a) Area of parallelogram = (Base $\times$ Height).

   (b) Area of a rhombus = $\frac{1}{2} \times$ (Product of diagonals).

   (c) Area of a trapezium = $\frac{1}{2} \times$ (sum of parallel sides) x distance between them.

5. (a) Area of a circle = πR^2, where R is the radius.

   (b) Circumference of a circle = $2\pi R$.

(c). Length of an arc = $\frac{2\pi R\theta}{360}$, where θ is the central angle.

(d) Area of a sector = $\frac{1}{2}$(arc × R) = $\frac{\pi R^2\theta}{360}$.

EXERCISE

1. The ratio between the length and the breadth of a rectangular park is 3 : 2. If a man cycling along the boundary of the park at the speed of 12 km/hr completes one round in 8 minutes, then the area of the park (in sq. m) is:
   (a) 123600 (b) 153600 (c) 163650 (d) 173680
2. An error 2% in excess is made while measuring the side of a square. The percentage of error in the calculated area of the square is:
   (a) 3.05% (b) 5.5% (c) 7.1% (d) 4.04%
3. The ratio between the perimeter and the breadth of a rectangle is 5 : 1. If the area of the rectangle is 216 sq. cm, what is the length of the rectangle?
   (a) 8 cm (b) 18 cm (c) 12 cm (d) 15 cm
4. The percentage increase in the area of a rectangle, if each of its sides is increased by 20% is:
   (a) 28% (b) 33% (c) 44% (d) 52%
5. A rectangular park 60 m long and 40 m wide has two concrete crossroads running in the middle of the park and rest of the park has been used as a lawn. If the area of the lawn is 2109 sq. m, then what is the width of the road?
   (a) 1.5 m (b) 3 m (c) 4.5 m (d) 5.5 m
6. The diagonal of the floor of a rectangular closet is $7\frac{1}{2}$feet. The shorter side of the closet is $4\frac{1}{2}$ feet. What is the area of the closet in square feet?
   (a) 12 (b) 15 (c) 27 (d) 33
7. A towel, when bleached, was found to have lost 20% of its length and 10% of its breadth. The percentage of decrease in area is:
   (a) 12% (b) 15% (c) 20% (d) 28%
8. A man walked diagonally across a square lot. Approximately, what was the percent saved by not walking along the edges?
   (a) 18 (b) 20 (c) 30 (d) 35
9. The diagonal of a rectangle is $\sqrt{41}$ cm and its area is 20 sq. cm. The perimeter of the rectangle must be:
   (a) 12 cm (b) 18 cm (c) 22 cm (d) 25 cm
10. What is the least number of squares tiles required to pave the floor of a room 15 m 17 cm long and 9 m^2 cm broad?
    (a) 814 (b) 825 (c) 830 (d) 840
11. The difference between the length and breadth of a rectangle is 23 m. If its perimeter is 206 m, then its area is:
    (a) 1220 m^2 (b) 1350 m^2 (c) 2245 m^2(d) 2520 m^2
12. The length of a rectangle is halved, while its breadth is tripled. What is the percentage change in area?
    (a) 15% increase (b) 50% increase (c) 60% decrease (d) 65% decrease
13. The length of a rectangular plot is 20 metres more than its breadth. If the cost of fencing the plot @ 26.50 per metre is Rs. 5300, what is the length of the plot in metres?
    (a) 25 m (b) 45 m (c) 55 m (d) 60 m
14. A rectangular field is to be fenced on three sides leaving a side of 20 feet uncovered. If the area of the field is 680 sq. feet, how many feet of fencing will be required?
    (a) 22 (b) 33 (c) 68 (d) 88

ANSWERS AND EXPLANATIONS

1. Answer (b)

Perimeter = Distance covered in 8 min. = $\left(\frac{12000}{60} \times 8\right)$ m = 1600 m

Let length = 3x metres and breadth = 2x metres.

Then, 2(3x + 2x) = 1600 or x = 160.

∴ Length = 480 m and Breadth = 320 m.

∴ Area = (480 x 320) m² = 153600 m².

2. Answer (d)

100 cm is read as 102 cm.

$A_1 = (100 \times 100)\ cm^2$ and $A_2\ (102 \times 102)\ cm^2$.

$(A_2 - A_1) = [(102)^2 - (100)^2]$

$= (102 + 100) \times (102 - 100)$

$= 404\ cm^2$.

∴ Percentage error = $\left(\frac{404}{100 \times 100} \times 100\right)$ % = 4.04 %

3. Answer (b)

$\frac{2(l+b)}{b} = \frac{5}{1}$

⇒ 2l + 2b = 5b

⇒ 3b = 2l

⇒ $b = \frac{2}{3}l$

Then, Area = 216 cm^2

⇒ $l \times b = 216$

⇒ $l \times \frac{2}{3}l = 216$

⇒ $l^2 = 324$

⇒ $l = 18$ cm.

4. Answer (c)

Let original length = x metres

and original breadth = y metres.

Original area = (xy) m².

New length = $\left(\frac{120}{100}x\right)$ m = $\left(\frac{6}{5}x\right)$ m.

New breadth = $\left(\frac{120}{100}y\right)$ m = $\left(\frac{6}{5}y\right)$ m.

New area = $\left(\frac{6}{5}x \times \frac{6}{5}y\right) m^2 = \left(\frac{36}{25}xy\right)$

The difference between the original area = xy and new-area 36/25 xy is

= (36/25)xy – xy

= xy(36/25 – 1)

= xy(11/25) or (11/25)xy

∴ Increase % = $\left(\frac{11}{25}xy \times \frac{1}{xy} \times 100\right)$ % = 44%.

5. Answer (b)

Area of the park = (60 × 40) m^2 = 2400 m^2.

Area of the lawn = 2109 m².

∴ Area of the crossroads = (2400 – 2109) m^2 = 291 m^2.

Let the width of the road bexmetres. Then,

60x+ 40x–x²= 291

⇒ x²– 100x+ 291 = 0

⇒ (x– 97)(x– 3) = 0

⇒ x= 3.

6. Answer (c)

Other side = $\sqrt{\left(\frac{15}{2}\right)^2 - \left(\frac{9}{2}\right)^2}$ ft

⇒ Other side = $\sqrt{\frac{144}{4}} = \frac{12}{2} = 6$ ft

∴ Area of closet = (6 x 4.5) sq. ft = 27 sq. ft.

7. Answer (d)

Let original length = x and original breadth = y.

Decrease in area = xy – $\left(\frac{80x}{100} \times \frac{90y}{100}\right)$

= (xy – $\frac{18}{25}$xy) = $\frac{7}{25}$xy

∴ Decrease % = $\left(\frac{7}{25}xy \times \frac{1}{xy} \times 100\right)$ % = 28%.

8. Answer (c)

Let the side of the square(ABCD) be x metres.

C B

D A

Then, AB + BC = 2x metres.

AC = (1.41x) m.

Saving on 2x metres = (0.59x) m.

Saving % = $\left(\frac{0.59x}{2x} \times 100\right)$ % = 30% (approx.)

9. Answer (b)

$\sqrt{l^2 + b^2} = \sqrt{41}$

Also, lb= 20.

$(l+b)^2 = (l^2+b^2) + 2lb = 41 + 40 = 81$

$\Rightarrow \quad (l+b) = 9.$

$\therefore \quad$ Perimeter $= 2(l+b) = 18$ cm.

10. Answer (a)

Length of largest tile = H.C.F. of 1517 cm and 902 cm = 41 cm.

Area of each tile = (41×41) cm².

$\therefore \quad$ Required number of tiles $= \dfrac{1517 \times 902}{41 \times 41} = 814.$

11. Answer (d)

We have: $(l-b) = 23$ and $2(l+b) = 206$ or $(l+b) = 103$.

Solving the two equations, we get: $l = 63$ and $b = 40$.

$\therefore \quad$ Area $= (l \times b) = (63 \times 40)\ m^2 = 2520\ m^2$.

12. Answer (b)

Let original length $= x$ and original breadth $= y$.

Original area $= xy$.

New length $= \dfrac{x}{2}$

New breadth $= 3y$.

New area $= \left(\dfrac{x}{2} \times 3y\right) = \dfrac{3}{2}xy.$

$\therefore \quad$ Increase % $= \left(\dfrac{1}{2}xy \times \dfrac{1}{xy} \times 100\right)\% = 50\%.$

13. Answer (d)

Let breadth $= x$ metres.

Then, length $= (x + 20)$ metres.

Perimeter $= \left(\dfrac{5300}{26.50}\right)$ m $= 200$ m.

$\therefore \quad 2[(x + 20) + x] = 200$

$\Rightarrow \quad 2x + 20 = 100$

$\Rightarrow \quad 2x = 80$

$\Rightarrow \quad x = 40.$

Hence, length $= x + 20 = 60$ m.

14. Answer (d)

We have: $l = 20$ ft and $lb = 680$ sq. ft.

So, $b = 34$ ft.

$\therefore \quad$ Length of fencing $= (l + 2b) = (20 + 68)$ ft $= 88$ ft.

TRIANGLES

More geometry questions pertain to triangle than to any other topic. To answer them, there are several important facts that you need to know about the angles and sides of triangles. There are some key facts which are very useful. These are as under:

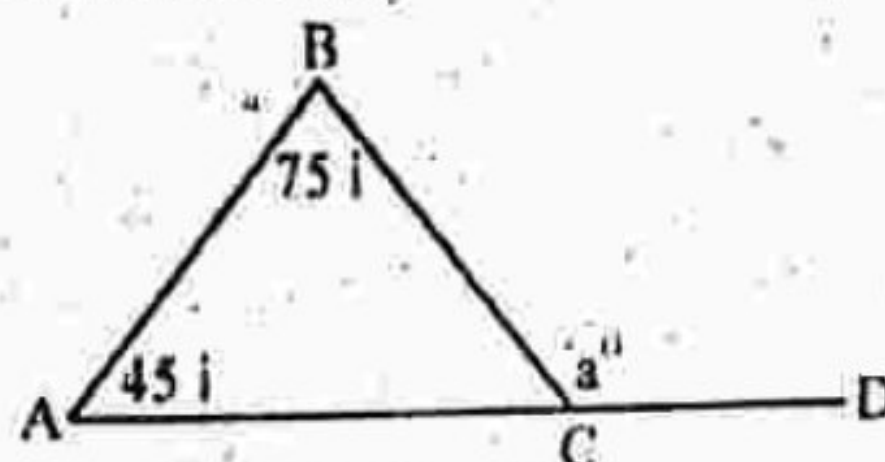
1. In any triangle, the sum of the measures of the three angles is 180°.
   $x + y + z = 180$
2. The measure of an exterior angle of a triangle is equal to sum of the measures of the two opposite interior angles.
3. In any triangle:
   (i) the longest side is opposite the largest angle;
   (ii) the shortest side is opposite the smallest angle;
   (iii) sides with the same length are opposite angles with the same measure.
4. In any right triangle, the sum of the measures of the two acute angles is 90°.
5. An altitude divides an equilateral triangle into two 30 – 60 – 90 right triangles.

EXERCISE

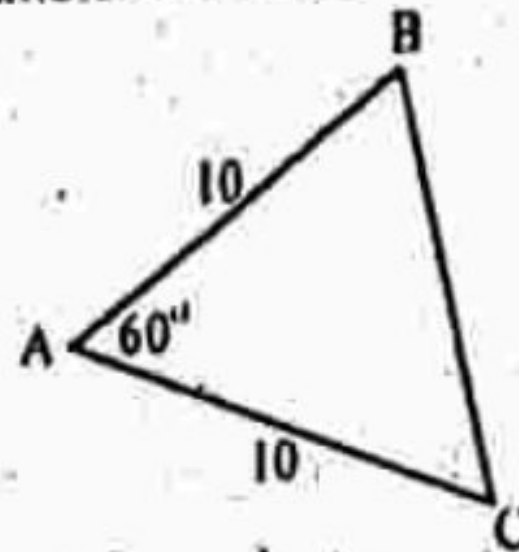
1. What is the area of an equilateral triangle whose sides are 10?

   (a) $25\sqrt{3}$ (b) 50 (c) $50\sqrt{3}$ (d) 100

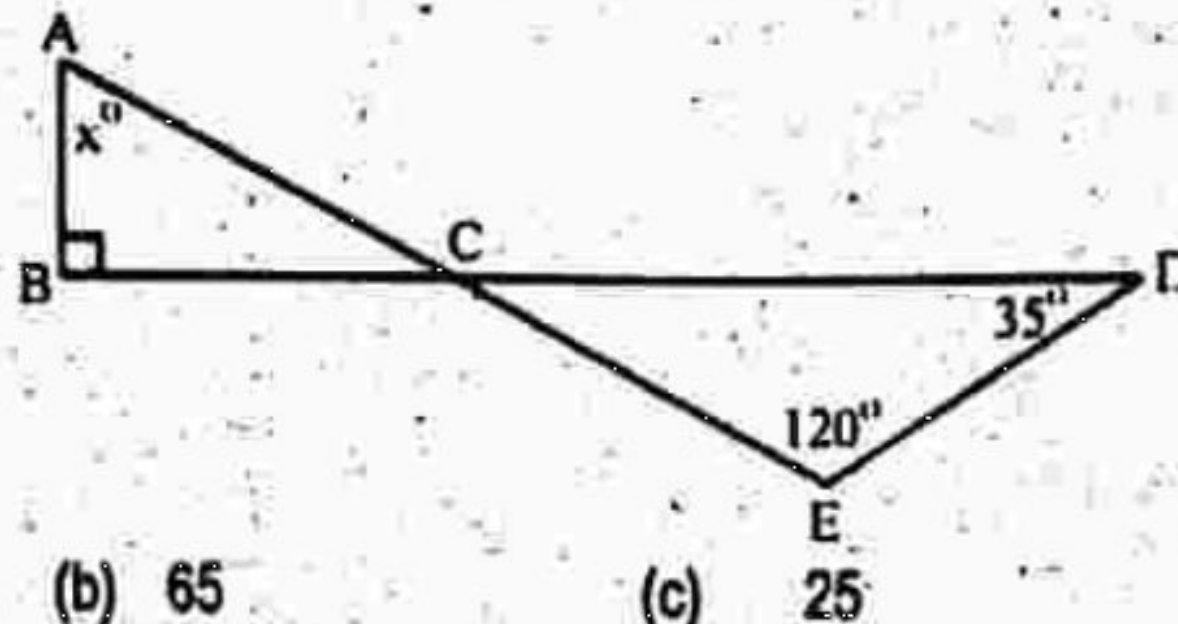
2. In the figure at the right, what is the value of a?

   B, 75°, A, 45°, C, a°, D

   (a) 45 (b) 60 (c) 75 (d) 120

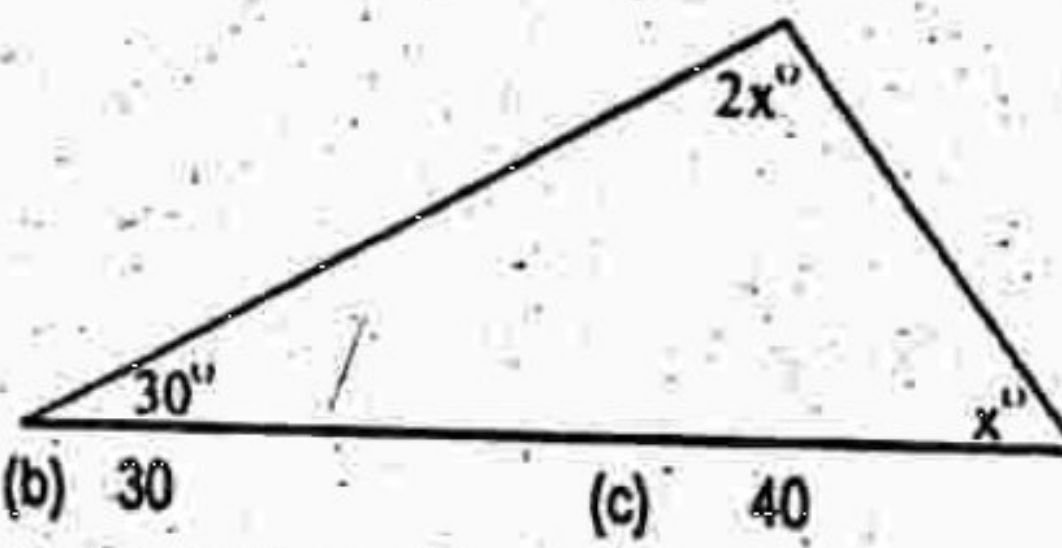
3. In the figure at the right, what is the perimeter of ΔABC?

B, 10, A, 60°, 10, C

(a) $20 + 10\sqrt{2}$ (b) $20 + 10\sqrt{3}$ (c) 25 (d) 30

4. In the figure below, what is the value of x?

A, x°, B, C, D, 35°, 120°, E

(a) 45 (b) 65 (c) 25 (d) 55

5. In the triangle below, what is the value of x?

$2x^{\circ}$, 30°, x°

(a) 20 (b) 30 (c) 40 (d) 50

6. If the difference between the measures of the two smaller angles of a right triangle is 8°, what is the measure, in degrees, of the smallest angle?

(a) 41 (b) 42 (c) 49 (d) 53

7. Two sides of a right triangle are 12 and 13. Which of the following could be the length of the third side?

I. 5 II. 11 III. $\sqrt{313}$

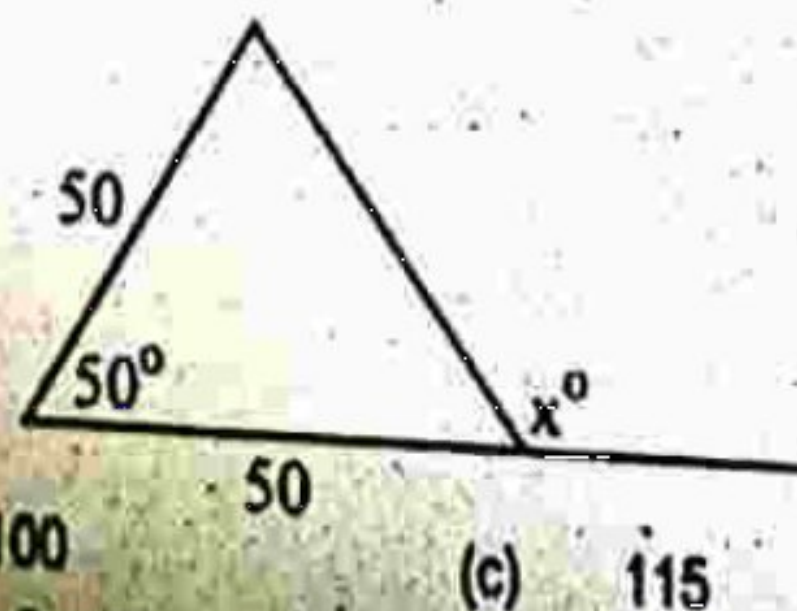
(a) I only (b) II only (c) I and II (d) I and III

8. What is the value of PS in the triangle below?

S

(a) $5\sqrt{2}$ (b) 13 (c) 11 (d) 10

9 What is the value of x in the figure below?

50, 50°, x°, 50

(a) 80 (b) 100 (c) 115 (d) 120

Questions 10 – 11 refer to the following figure.

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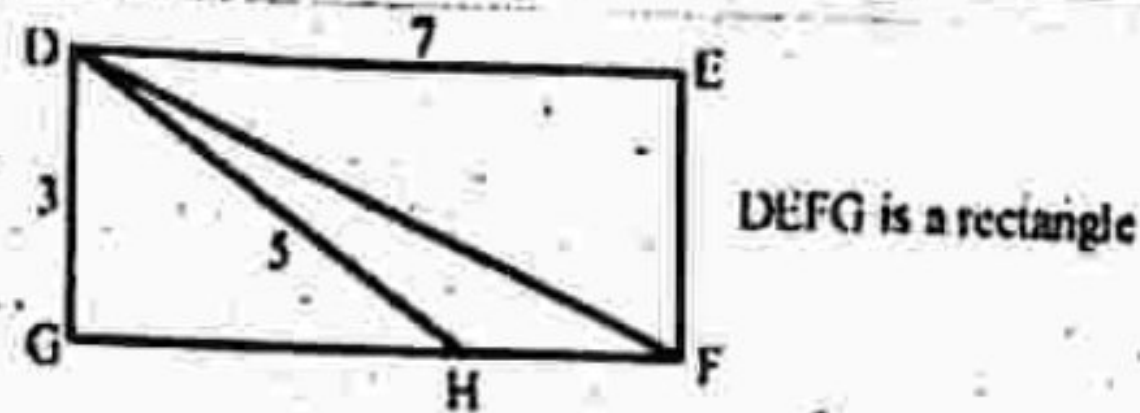
D 7 E, 3, 5, G H F

DEFG is a rectangle

10. What is the area of ΔDFH?
(a) 3 (b) 4.5 (c) 6 (d) 7.5

11. What is the perimeter of ΔDFH?
(a) $8+\sqrt{41}$ (b) $8+\sqrt{58}$ (c) 16 (d) 17

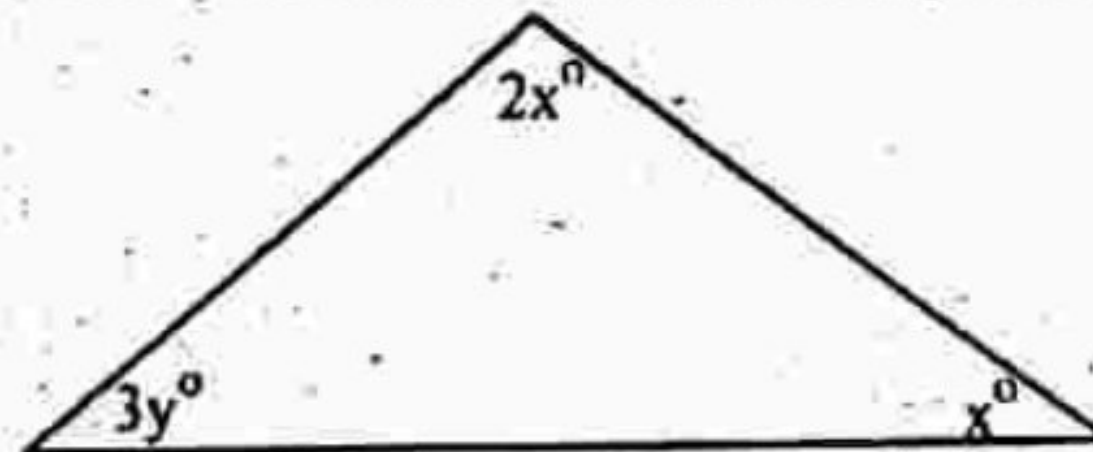
Questions 12 – 13 refer to the following figure.

z

12. What is the perimeter of ΔABC?
(a) 48 (b) $48+12\sqrt{3}$ (c) $48+12\sqrt{2}$ (d) 60

13. What is the area ΔABC?
(a) 108 (b) $54+72\sqrt{2}$ (c) $54+72\sqrt{3}$ (d) 198

14. Which of the following expresses a true relationship between x and y in the figure below?

$2x^o$, $3y^o$, x^o

(a) $y=60-x$ (b) $y=x$ (c) $x+y=90$ (d) $y=180-3x$

ANSWERS AND EXPLANATIONS

1. Answer (a)

The area of $\Delta = \frac{1}{2}(10)(5\sqrt{3}) = 25\sqrt{3}$.

2. Answer (d)

$a = 45 + 75 = 120$

3. Answer (d)

Since $AB = AC$, $m\angle B = m\angle C$. Represent each of them by x.

Then, $x + x + 60 = 180 \Rightarrow 2x = 120 \Rightarrow x = 60$

Since the measure of each angle of ΔABC is 60, the triangle is equilateral.

So, $BC = 10$, and the perimeter is $10 + 10 + 10 = 30$

4. Answer (b)

$\angle DCE + 120 + 35 = 180$

$\Rightarrow \angle DCE + 155 = 180$

$\Rightarrow \angle DCE = 25$

Since vertical angles are equal, $m\angle ACB = 25$

$x + 90 + 25 = 180$

$\Rightarrow x + 115 = 180$

$\Rightarrow x = 65$

5. Answer (d)

$x + 2x + 30 = 180$

$\Rightarrow 3x + 30 = 180$

$\Rightarrow 3x = 150$

$\Rightarrow x = 50$.

6. Answer (c)

Let the angles by x and y

So, $x + y = 90$ and $x - y = 8$

Now solve for we get $x = 49$

7. Answer (d)

A right triangle cannot be of lengths 11, 12, 13.

So II is false.

8. Answer (b)

Since $PR = 20$ and $QR = 16$, ΔPQR is a right triangle.

So $PQ = 12$

ΔPQS is a right triangle whose legs are 5 and 12.

The hypotenuse, PS, therefore, is 13.

9. Answer (c)
Label the other angles in the triangle as a and b.
So, $50 + a + b = 180$
$\Rightarrow a + b = 130$ and since the triangle is isosceles, $a = b$, therefore, a and b are each 65, and $x = 180 - 65 = 115$.

10. Answer (b)
Area of $\triangle DGH = (0.5) \times (3) \times (4) = 6$
Area of $\triangle DGF = (0.5) \times (3) \times (7) = 10.5$
So Area of $\triangle DFH$ = Area of $\triangle DGF$ - Area of $\triangle DGH$
$= 4.5$

11. Answer (b)
By the Pythagorean therefore,
$(DF)^2 = 3^2 + 7^2 = 9 + 49 = 58$
$\Rightarrow DF = \sqrt{58}$.
So the perimeter is $3 + 5 + \sqrt{58} = 8 + \sqrt{58}$

12. Answer (b)
$\triangle ADC$ is a 30 – 60 – 90 triangle, whose shorter leg is 12. Hypotenuse AC is 24, and leg CD is $12\sqrt{3}$. So the perimeter is: $24 + 15 + 9 + 12\sqrt{3} = 48 + 12\sqrt{3}$

13. Answer (c)
We have the base $(9 + 12\sqrt{3})$, and height 12 of $\triangle ABC$. Then, the area is, $\frac{1}{2}(12)(9 + 12\sqrt{3}) = 54 + 72\sqrt{3}$.

14. Answer (a)
$x + 2x + 3y = 180$
$\Rightarrow 3x + 3y = 180$
$\Rightarrow x + y = 60$
$\Rightarrow y = 60 - x$.

CIRCLES

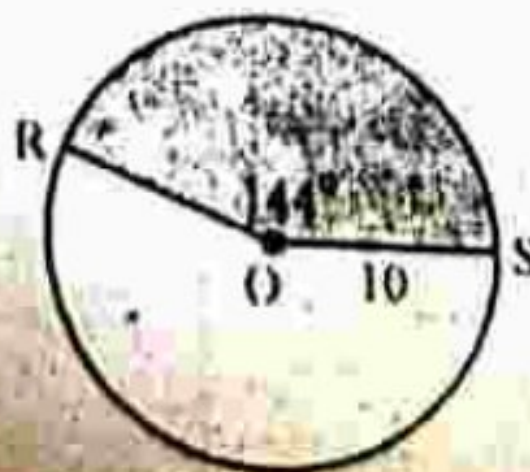
EXERCISE

1. What is the circumference of a circle whose area is 100π?
   (a) 10 (b) 20 (c) 10π (d) 20π
2. What is the area of a circle whose circumference is π?
   (a) $\frac{\pi}{4}$ (b) $\frac{\pi}{2}$ (c) π (d) 2π
3. If in the figure below, the area of the shaded sector is 85 % of the area of the entire circle, what is the value of w?

   w°

   (a) 15 (b) 30 (c) 45 (d) 54

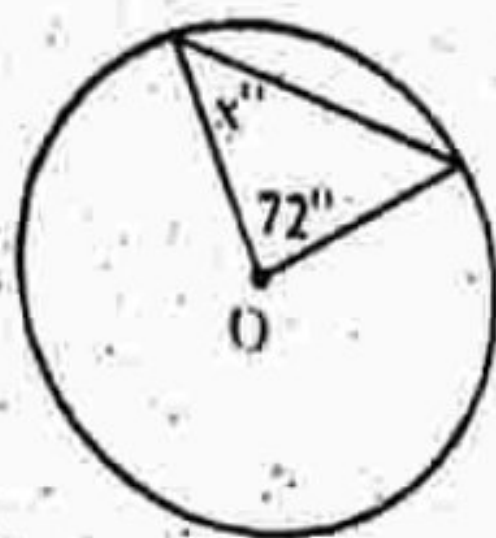
Question 4 – 5 refer to the following figure.

R, 144°, O, 10, S

4. What is the length of arc RS?
   (a) 8 (b) 20 (c) 8π (d) 20π
5. What is the area of the shaded sector?

(a) 8 (b) 20π (c) 8π (d) 40π

6. The circumference of a circle is $a\pi$ units, and the area of the circle is $b\pi$ square units. If a = b, what is the radius of the circle?

(a) 1 (b) 2 (c) 3 (d) π

7. In the figure below, what is the value of x?

(a) 30 (b) 36 (c) 45 (d) 54

8. If A is the area and C the circumference of a circle, which of the following is an expression for A in terms of C?

(a) $\frac{C^2}{4\pi}$ (b) $\frac{C^2}{4\pi^2}$ (c) 2C (d) $2C^2\sqrt{\pi}$

ANSWERS AND EXPLANATIONS

1. Answer (d)

$A = \pi r^2 = 100\pi \Rightarrow r^2 = 100 \Rightarrow r = 10$

So, $C = 2\pi r = 2\pi(10) = 20\pi$.

2. Answer (a)

$C = 2\pi r \Rightarrow 2r = 1 \Rightarrow r = \frac{1}{2}$

So, $A = \pi r^2 = \pi\left(\frac{1}{2}\right)^2 = \frac{1}{4}\pi = \frac{\pi}{4}$

3. Answer (d)

Since the shaded area is 85% of the circle, the white area is 15% of the circle.

So, w is 15% of 360°: $0.15 \times 360 = 54$

4. Answer (c)

The length of the are RS is $\frac{144}{360}$ of the circumference:

$\left(\frac{144}{360}\right) 2\pi(10) = \left(\frac{2}{5}\right) 20\pi = 8\pi$.

5. Answer (d)

The area of the shaded sector is $\left(\frac{144}{360}\right)$ of the area of the circle: $\left(\frac{144}{360}\right)\pi(10)^2 = \left(\frac{2}{5}\right) 100\pi = 40\pi$.

6. Answer (b)

Since $C = a\pi = b\pi = A$,

we have $2\pi r = \pi r^2$

$\Rightarrow 2r = r^2$

$\Rightarrow r = 2$.

7. Answer (d)

$180 = 72 + 2x$

$\Rightarrow 2x = 108$

$\Rightarrow x = 54$

8. Answer (a)

$C = 2\pi r \Rightarrow r = \frac{C}{2\pi}$

$\Rightarrow A = \pi\left(\frac{C}{2\pi}\right)^2 = \frac{C^2}{4\pi}$

VOLUME AND SURFACE AREA

1. CUBOID

Let length $= l$, breadth $= b$ and height $= h$ units. Then

Volume= $(l \times b \times h)$ cubic units.

Surface area= $2(lb+bh+lh)$ sq. units.

2. CUBE

Let each edge of a cube be of length a. Then,

Volume= a^3 cubic units.

Surface area= $6a^2$ sq. units.

3. CYLINDER

Let radius of base = r and Height (or length) = h. Then,

Volume= ($\pi r^2 h$) cubic units.

Curved surface area =($2\pi rh$) sq. units.

Total surface area= $2\pi r(h+r)$ sq. units.

4. CONE

Let radius of base = r and Height = h. Then,

Volume= $\left(\frac{1}{3}\pi r^2 h\right)$ cubic units.

Curved surface area= (πrl) sq. units.

Total surface area= ($\pi rl+\pi r^2$) sq. units.

5. SPHERE

Let the radius of the sphere be r. Then,

Volume= $\left(\frac{4}{3}\pi r^3\right)$ cubic units.

Surface area= ($4\pi r^2$) sq. units.

6. HEMISPHERE

Let the radius of a hemisphere be r. Then,

Volume= $\left(\frac{2}{3}\pi r^3\right)$ cubic units.

Curved surface area= ($2\pi r^2$) sq. units.

Total surface area= ($3\pi r^2$) sq. units.

Note: 1 litre = 1000 cm^3.

EXERCISE

1. The sum of the lengths of all the edges of a cube is 6 centimeters. What is the volume, in cubic centimeters, of the cube?
   (a) 1/8 (b) ¼ (c) 1/2 (d) 1
2. What is the volume of a cube whose surface area is 150?
   (a) 25 (b) 100 (c) 125 (d) 1000
3. What is the number of cubic inches in one cubic foot?
   (a) 12 (b) 144 (c) 684 (d) 1728
4. *A solid metal cube of edge 3 feet is placed in a rectangular tank whose length, width, and height are 3, 4 and 5 feet, respectively. What is the volume, in cubic feet, of water that the tank can now hold?*
   (a) 20 (b) 27 (c) 33 (d) 48
5. *The height, h, of a cylinder is equal to the edge of a cube. If the cylinder and cube have the same volume, what is the radius of the cylinder?*
   (a) $\frac{h}{\sqrt{\pi}}$ (b) $h\sqrt{\pi}$ (c) $\frac{\sqrt{\pi}}{h}$ (d) $\frac{h^2}{\pi}$
6. A 5-foot-long cylindrical pipe has an inner diameter of 6 feet and an outer diameter of 8 feet. If the total surface area (inside and out, including the ends) is kπ, what is the value of k?
   (a) 7 (b) 40 (c) 48 (d) 84

7. Three identical balls fit snugly into a cylindrical can: the radius of the spheres equals the radius of the can, and the balls just touch the bottom and the top f the can. If the formula for the volume of a sphere is $V = \frac{4}{3}r^3$, what fraction of the volume of the can is taken up by the balls?
   (a) $\frac{1}{6}$ (b) $\frac{1}{3}$ (c) $\frac{1}{2}$ (d) $\frac{2}{3}$

8. 66 cubic centimetres of silver is drawn into a wire 1 mm in diameter. The length of the wire in metres will be:
   (a) 84 (b) 88 (c) 92 (d) 98
9. The curved surface area of a cylindrical pillar is 264 m^2 and its volume is 924 m^3. Find the ratio of its diameter to its height.
   (a) 2 : 5 (b) 7 : 3 (c) 5 : 7 (d) 4 : 7
10. How many bricks, each measuring 25 cm x 11.25 cm x 6 cm, will be needed to build a wall of 8 m x 6 m x 22.5 cm?
   (a) 4000 (b) 5000 (c) 6400 (d) 6700
11. A large cube is formed from the material obtained by melting three smaller cubes of 3, 4 and 5 cm side. What is the ratio of the total surface areas of the smaller cubes and the large cube?
   (a) 3 : 5 (b) 8 : 13 (c) 25 : 18 (d) 29 : 35
12. A boat having a length 3 m and breadth 2 m is floating on a lake. The boat sinks by 1 cm when a man gets on it. The density of water is 1000 kg/m^3. The mass of the man is:
   (a) 30 kg (b) 60 kg (c) 65 kg (d) 70 kg
13. A hall is 15 m long and 12 m broad. If the sum of the areas of the floor and the ceiling is equal to the sum of the areas of four walls, the volume of the hall is:
   (a) 800 (b) 850 (c) 1200 (d) 1350
14. A right triangle with sides 3 cm, 4 cm and 5 cm is rotated the side of 3 cm to form a cone. The volume of the cone so formed is:
   (a) 12 πcm^3 (b) 18 πcm^3 (c) 20 πcm^3 (d) 25 πcm^3
15. A metallic sheet is of rectangular shape with dimensions 48 m x 36 m. From each of its corners, a square is cut off so as to make an open box. If the length of the square is 8 m, the volume of the box (in m3) is:
   (a) 4088 (b) 5120 (c) 6210 (d) 6600

ANSWERS AND EXPLANATIONS

1. Answer (a)

Since a cube has 12 edges, we have $12e = 6 \Rightarrow e = \frac{1}{2}$

Therefore, $V = e^3 = \left(\frac{1}{2}\right)^3 = \frac{1}{8}$

2. Answer (c)
Since the surface area is 150, each of the 6 faces is a square whose area is 150 ÷ 6 = 25. So, the edges are all 5, and the volume is $5^3 = 125$.

3. Answer (d)
The volume of the cube whose edges are 1 foot can be expressed in either of two ways:

$(1 \text{ foot})^3 = 1$ cubic foot

or

$(12 \text{ inches})^3 = 1728$ cubic inches.

4. Answer (c)
The volume of the tank is $3 \times 4 \times 5 = 60$ cubic units, but the solid cube is taking up $= 3^3 = 27$ cubic units. Therefore the tank can hold $60 - 27 = 33$ cubic units of water.

5. Answer (a)
Since the volumes are equal, $\pi r^2 h = e^3 = h^3$

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Therefore, $\pi r^2 = h^2 \Rightarrow r^2 = \frac{h^2}{\pi} \Rightarrow r = \frac{h}{\sqrt{\pi}}$

6. Answer (d)
Total surface area = $40\pi + 30\pi + 7\pi + 7\pi = 84\pi$
$\Rightarrow k = 84.$

7. Answer (d)
To avoid using r,asume that the radius of the spheres and the can are 1.

Then the volume of each ball is $\frac{4}{3}\pi(1)^3 = \frac{4}{3}\pi$, and the

totl volume of the 3 balls is = 4π.

Since the light of the can is 6,

the voume of the can is $\pi(1)^2(6) = 6\pi$.

So the balls take up $\frac{4\pi}{6\pi} = \frac{2}{3}$ of the can.

8. Answer (a)
Let the length of the wire be h.

Radius = $\frac{1}{2}$ mm = $\frac{1}{20}$ cm. Then,

$\Rightarrow \quad \frac{22}{7} \times \frac{1}{20} \times \frac{1}{20} \times h = 66.$

$\Rightarrow \quad h = \left(\frac{66 \times 20 \times 20 \times 7}{22}\right) = 8400$ cm = 84 m.

9. Answer (b)
$\frac{\pi r^2 h}{2\pi rh} = \frac{924}{264} \Rightarrow r = \left(\frac{924}{264} \times 2\right) = 7$ m.

$\therefore$ Required ratio = $\frac{2r}{h} = \frac{14}{6} = 7 : 3.$

10. Answer (c)
Number of bricks = $\frac{\text{Volume of the wall}}{\text{Volume of 1 brick}}$

$= \left(\frac{800 \times 600 \times 22.5}{25 \times 11.25 \times 6}\right) =$

6400.

11. Answer (c)
Volume of the large cube = $(3^3 + 4^3 + 5^3) = 216$ cm³.
Let the edge of the large cube be a.
So, $a^3 = 216 \Rightarrow a = 6$ cm.

$\therefore$ Required ratio = $\left(\frac{6 \times (3^2 + 4^2 + 5^2)}{6 \times 6^2}\right) = \frac{50}{36} = 25$

: 18.

12. Answer (b)
Volume of water displaced = $(3 \times 2 \times 0.01)$ m³ = 0.06

m³.

Mass of man = Vol. of water displaced × Density of water

= (0.06×1000) kg

= 60 kg.

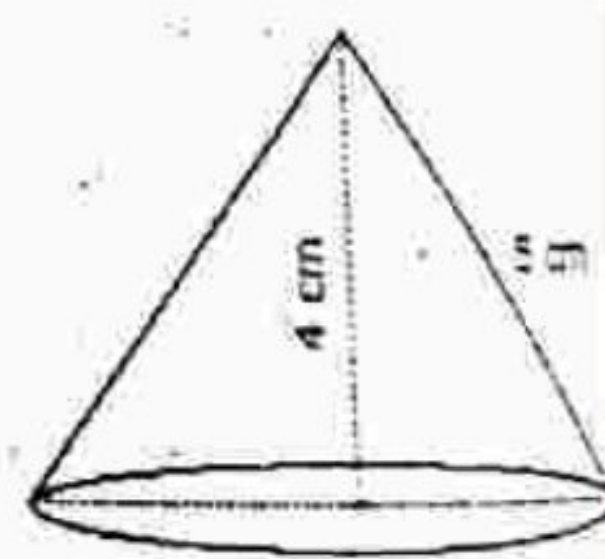
13. Answer (c)
$2(15 + 12) \times h = 2(15 \times 12)$

$\Rightarrow \quad h = \frac{180}{27}$ m $\frac{20}{3}$ m.

$\therefore$ Volume = $\left(15 \times 12 \times \frac{20}{3}\right)$ m³ = 1200 m³.

14. Answer (a)

4 cm 5 cm 3 cm

4 cm 5 cm

Radius = 3 cm

Clearly, we have $r = 3$ cm and $h = 4$ cm.

$\therefore$ Volume = $\frac{1}{3}\pi r^2 h = \left(\frac{1}{3} \times \pi \times 3^2 \times 4\right)$ cm³ = 12π

cm³.

15. Answer (b)
Clearly, l = (48 – 16) m = 32 m,
b = (36 - 16)m = 20 m,
h = 8 m.
$\therefore$ Volume of the box = $(32 \times 20 \times 8)$ m³ = 5120 m³

MISCELLANEOUS

TIME AND DISTANCE

Important Formulas

Speed, Time and Distance:

$$\text{Speed} = \left(\frac{\text{Distance}}{\text{Time}}\right), \text{Time} = \left(\frac{\text{Distance}}{\text{Speed}}\right), \text{Distance} = (\text{Speed} \times \text{Time}).$$

km/hr to m/sec conversion:

$$x \text{ km/hr} = \left(x \times \frac{5}{18}\right) \text{m/sec.}$$

m/sec to km/hr conversion:

$$x \text{ m/sec} = \left(x \times \frac{18}{5}\right) \text{km/hr.}$$

If the ratio of the speeds of A and B is $a : b$, then the ratio of the the times taken by then to cover the same distance is $\frac{1}{a} : \frac{1}{b}$ or $b : a$.

Suppose a man covers a certain distance at x km/hr and an equal distance at y km/hr. Then, the average speed during the whole journey is $\left(\frac{2xy}{x+y}\right)$ km/hr.

EXERCISE

1. A person crosses a 600 m long street in 5 minutes. What is his speed in km per hour?
   (a) 3.6 (b) 7.2 (c) 8.4 (d) 10
2. An aeroplane covers a certain distance at a speed of 240 kmph in 5 hours. To cover the same distance in $1\frac{2}{3}$ hours, it must travel at a speed of:
   (a) 250 kmph (b) 385 kmph (c) 680 kmph (d) 720 kmph
3. If a person walks at 14 km/hr instead of 10 km/hr, he would have walked 20 km more. The actual distance travelled by him is:
   (a) 50 km (b) 60 km (c) 65 km (d) 85 km
4. A train can travel 50% faster than a car. Both start from point A at the same time and reach point B 75 km away from A at the same time. On the way, however, the train lost about 12.5 minutes while stopping at the stations. The speed of the car is:
   (a) 90 kmph (b) 95 kmph (c) 120 kmph (d) 125 kmph
5. Excluding stoppages, the speed of a bus is 54 kmph and including stoppages, it is 45 kmph. For how many minutes does the bus stop per hour?
   (a) 7 (b) 10 (c) 15 (d) 22
6. In a flight of 600 km, an aircraft was slowed down due to bad weather. Its average speed for the trip was reduced by 200 km/hr and the time of flight increased by 30 minutes. The duration of the flight is:
   (a) 1 hour (b) 2 hours (c) 4 hours (d) 5 hours
7. A man completes a journey in 10 hours. He travels first half of the journey at the rate of 21 km/hr and second half at the rate of 24 km/hr. Find the total journey in km.
   (a) 200 km (b) 224 km (c) 240 km (d) 245 km
8. The ratio between the speeds of two trains is 7 : 8. If the second train runs 400 km in 4 hours, then the speed of the first train is:
   (a) 65.5 km/hr (b) 75 km/hr (c) 85.25 km/hr (d) 87.5 km/hr
9. A man on tour travels first 160 km at 64 km/hr and the next 160 km at 80 km/hr. The average speed for the first 320 km of the tour is:
   (a) 40.45 km/hr (b) 50.25 km/hr (c) 71.11 km/hr (d) 80 km/hr
10. In covering a distance of 30 km, Ali takes 2 hours more than Shabbir. If Ali doubles his speed, then he

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would take 1 hour less than Shabbir. Ali's speed is:
(a) 5 kmph (b) 7 kmph (c) 9 kmph (d) 12 kmph

11. Rashid is travelling on his cycle and has calculated to reach point A at 2 P.M. If he travels at 10 kmph, he will reach there at 12 noon if he travels at 15 kmph. At what speed must he travel to reach A at 1 P.M.?
(a) 3 kmph (b) 8 kmph (c) 12 kmph (d) 16 kmph

12. A farmer travelled a distance of 61 km in 9 hours. He travelled partly on foot @ 4 km/hr and partly on bicycle @ 9 km/hr. The distance travelled on foot is:
(a) 8 km (b) 12 km (c) 16 km (d) 19 km

ANSWERS AND EXPLANATIONS

1. Answer (b)

Speed = $\left(\frac{600}{5 \times 60}\right)$ m/sec.

= 2 m/sec.

Converting m/sec to km/hr

= $\left(2 \times \frac{18}{5}\right)$ km/hr

= 7.2 km/hr.

2. Answer (d)

Distance = (240 × 5) = 1200 km.

Speed = Distance/Time

Speed = 1200/(5/3) km/hr.

∴ Required speed = $\left(1200 \times \frac{3}{5}\right)$ km/hr = 720 km/hr.

3. Answer (a)

Let the actual distance travelled be x km.

Then, $\frac{x}{10} = \frac{x+20}{14}$

⇒ $14x = 10x + 200$

⇒ $4x = 200$

⇒ $x = 50$ km.

4. Answer (c)

Let speed of the car be x kmph.

Then, speed of the train = $\frac{150}{100}x = \left(\frac{3}{2}x\right)$ kmph.

∴ $\frac{75}{x} - \frac{75}{(3/2)x} = \frac{125}{10 \times 60}$

⇒ $\frac{75}{x} - \frac{50}{x} = \frac{5}{24}$

⇒ $x = \left(\frac{25 \times 24}{5}\right) = 120$ kmph.

5. Answer (b)

Due to stoppages, it covers 9 km less.

Time taken to cover 9 km = $\left(\frac{9}{54} \times 60\right)$ min. = 10 min.

6. Answer (a)

Let the duration of the flight be x hours.

Then, $\frac{600}{x} - \frac{600}{x + (1/2)} = 200$

⇒ $\frac{600}{x} - \frac{1200}{2x+1} = 200$

⇒ $x(2x + 1) = 3$

⇒ $2x^2 + x - 3 = 0$

⇒ $(2x + 3)(x - 1) = 0$

⇒ $x = 1$ hr. [neglecting the -ve value of x]

7. Answer (b)

$\frac{(1/2)x}{21} + \frac{(1/2)x}{24} = 10$

⇒ $\frac{x}{21} + \frac{x}{24} = 20$

⇒ $15x = 168 \times 20$

⇒ $x = \left(\frac{168 \times 20}{15}\right) = 224$ km.

8. Answer (d)

Let the speed of two trains be $7x$ and $8x$ km/hr.

Then, $8x = \left(\frac{400}{4}\right) = 100$

⇒ $x = \left(\frac{100}{8}\right) = 12.5$

∴ Speed of first train = (7 × 12.5) km/hr = 87.5 km/hr.

9. Answer (c)

Total time taken = $\left(\frac{160}{64} + \frac{160}{80}\right)$ hrs. = $\frac{9}{2}$ hrs.

∴ Average speed = $\left(320 \times \frac{2}{9}\right)$ km/hr = 71.11 km/hr.

10. Answer (a)

Let Ali's speed be x km/hr.

Then, $\frac{30}{x}-\frac{30}{2x}=3$

$\Rightarrow$ $6x = 30$

$\Rightarrow$ $x = 5$ km/hr.

11. Answer (c)

Let the distance travelled be x km.

Then, $\frac{x}{10}-\frac{x}{15}=2$

$\Rightarrow$ $3x-2x=60$

$\Rightarrow$ $x = 60$ km.

Time taken to travel 60 km at 10 km/hr = $\left(\frac{60}{10}\right)$ hrs = 6 hrs.

So, Rashid started 6 hours before 2 P.M. *i.e.*, at 8 A.M.

$\therefore$ Required speed = $\left(\frac{60}{5}\right)$ kmph. = 12 kmph.

12. Answer (c)

Let the distance travelled on foot be x km.

Then, distance travelled on bicycle = $(61 - x)$ km.

So, $\frac{x}{4}+\frac{(61-x)}{9}=9$

$\Rightarrow$ $9x + 4(61 - x) = 9 \times 36$

$\Rightarrow$ $5x = 80$

$\Rightarrow$ $x = 16$ km.

PROBLEMS ON AGES

EXERCISE

1. A man is 24 years older than his son. In two years, his age will be twice the age of his son. The present age of his son is:
   (a) 12 years (b) 15 years (c) 18 years (d) 22 years
2. Six years ago, the ratio of the ages of Khalid and Sadaf was 6 : 5. Four years hence, the ratio of their ages will be 11 : 10. What is Sadaf's age at present?
   (a) 16 years (b) 20 years (c) 22 years (d) 25 years
3. The sum of the present ages of a father and his son is 60 years. Six years ago, father's age was five times the age of the son. After 6 years, son's age will be:
   (a) 10 years (b) 12 years (c) 16 years (d) 20 years
4. At present, the ratio between the ages of Ali and Bashir is 4 : 3. After 6 years, Ali age will be 26 years. What is the age of Bashir at present?
   (a) 8 years (b) 15 years (c) 18 and half years (d) 25years
5. Sohail is younger than Rana by 7 years. If their ages are in the respective ratio of 7 : 9, how old is Sohail?
   (a) 12.5 years (b) 15 years (c) 22 years (d) 24.5 years
6. The present ages of three persons are in proportions 4 : 7 : 9. Eight years ago, the sum of their ages was 56. Find their present ages (in years).
   (a) 7, 20, 22 (b) 16, 28, 36 (c) 18, 34, 36(d) 20, 26, 44
7. Ayesha's father was 38 years of age when she was born while her mother was 36 years old when her brother four years younger to her was born. What is the difference between the ages of her parents?
   (a) 3 years, (b) 5 years (c) 6 years (d) 10 years
8. A person's present age is two-fifth of the age of his mother. After 8 years, he will be one-half of the age of his mother. How old is the mother at present?
   (a). 28 years (b) 33 years (c) 40 years (d) 44 years
9. The age of father 10 years ago was thrice the age of his son. Ten years hence, father's age will be twice that of his son. The ratio of their present ages is:
   (a) 4 : 7 (b) 7 : 3 (c) 7 : 9 (d) 11 : 13
10. Present ages of Anwar and Ali are in the ratio of 5 : 4 respectively. Three years hence, the ratio of their ages will become 11 : 9 respectively. What is Ali present age in years?
    (a) 24 (b) 25 (c) 30 (d) 35

ANSWERS AND EXPLANATIONS

1. Answer (d)

Let the son's present age be x years. Then, man's present age = $(x + 24)$ years.

$\therefore$ $(x + 24) + 2 = 2(x + 2)$

$\Rightarrow$ $x + 26 = 2x + 4$

$\Rightarrow$ $x = 22$.

2. Answer (a)

Let the ages of Khalid and Sadaf 6 years ago be $6x$ and $5x$ years respectively.

Then, $\frac{(6x+6)+4}{(5x+6)+4} = \frac{11}{10}$

$\Rightarrow$ $10(6x + 10) = 11(5x + 10)$

$\Rightarrow$ $5x = 10$ $\Rightarrow x = 2.$

$\therefore$ Sadaf's present age = $(5x + 6) = 16$ years.

3. Answer (d)

Let the present ages of son and father be x and $(60 - x)$ years respectively.

Then, $(60 - x) - 6 = 5(x - 6)$

$\Rightarrow$ $54 - x = 5x - 30$

$\Rightarrow$ $6x = 84$

$\Rightarrow$ $x = 14.$

$\therefore$ Son's age after 6 years = $(x + 6) = 20$ years.

4. Answer (b)

Let the present ages of Ali and Bashir be $4x$ years and $3x$ years respectively. Then,

$4x + 6 = 26 \Leftrightarrow 4x = 20$

$x = 5.$

$\therefore$ Bashir's age = $3x = 15$ years.

5. Answer (d)

Let Rana age be x years.

Then, Sohail's age = $(x - 7)$ years.

$\frac{x-7}{x} = \frac{7}{9}$

$\Rightarrow$ $9x - 63 = 7x$

$\Rightarrow$ $2x = 63$

$\Rightarrow$ $x = 31.5$

Hence, Sohail's age $= (x - 7) = 24.5$ year

6. Answer (b)

Let their present ages be $4x$, $7x$ and $9x$ years respectively.

Then, $(4x - 8) + (7x - 8) + (9x - 8) = 56$

$\Rightarrow$ $20x = 80$

$\Rightarrow$ $x = 4.$

$\therefore$ Their present ages are $4x = 16$ years, $7x = 28$ years and $9x = 36$ years respectively.

7. Answer (c)

Mother's age when Ayesha's brother was born = 36 years.

Father's age when Ayesha's brother was born $= (38 + 4)$ years $= 42$ years.

$\therefore$ Required difference $= (42 - 36)$ years $= 6$ years.

8. Answer (c)

Let the mother's present age be x years.

Then, the person's present age $= \left(\frac{2}{5}x\right)$ years.

$\therefore$ $\left(\frac{2}{5}x + 8\right) = \frac{1}{2}(x + 8)$

$\Rightarrow$ $2(2x + 40) = 5(x + 8)$

$\Rightarrow$ $x = 40.$

9. Answer (b)

Let the ages of father and son 10 years ago be $3x$ and x years respectively.

Then, $(3x + 10) + 10 = 2[(x + 10) + 10]$

$\Rightarrow 3x + 20 = 2x + 40$

$\Rightarrow x = 20.$

$\therefore$ Required ratio $= (3x + 10) : (x + 10) = 70 : 30 = 7 : 3.$

10. Answer (a)

Let the present ages of Anwar and Ali be $5x$ years and $4x$ years respectively.

Then, $\frac{5x+3}{4x+3} = \frac{11}{9}$

$\Rightarrow$ $9(5x + 3) = 11(4x + 3)$

$\Rightarrow$ $45x + 27 = 44x + 33$

$\Rightarrow$ $45x - 44x = 33 - 27$

$\Rightarrow$ $x = 6.$

$\therefore$ Ali's present age $= 4x = 24$ years.